Soil Survey of

Placer County, California

Western Part

United States Department of Agriculture

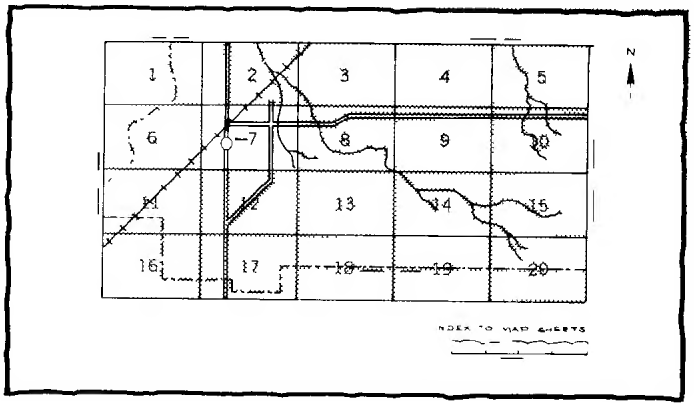
Soil Conservation Service

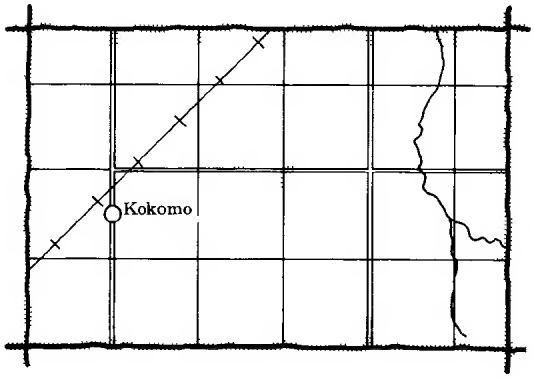
in cooperation with

University of California Agricultural Experiment Station

HOW TO USE

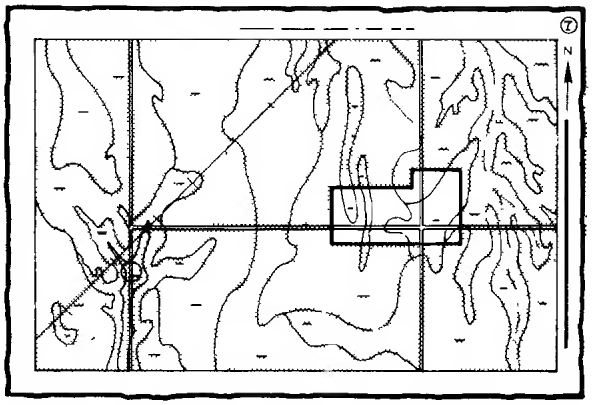
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

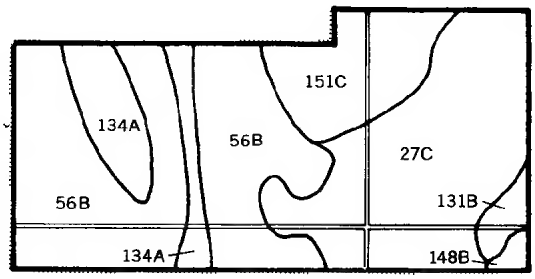




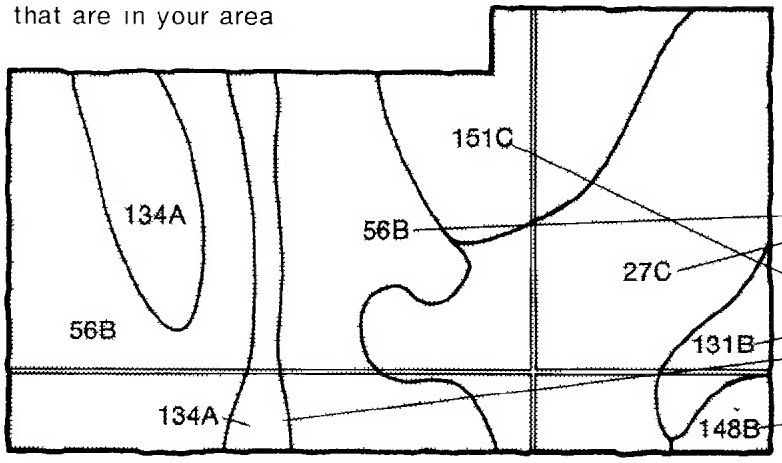
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area

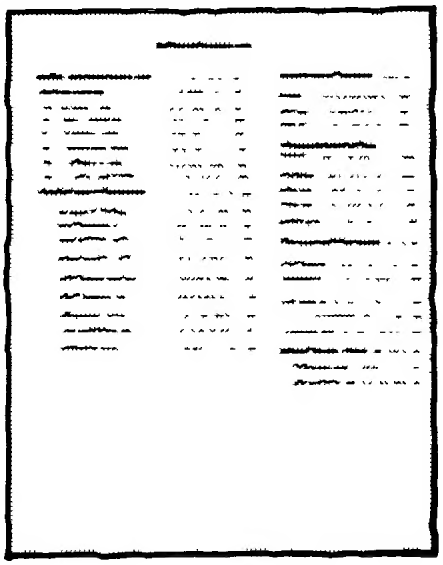


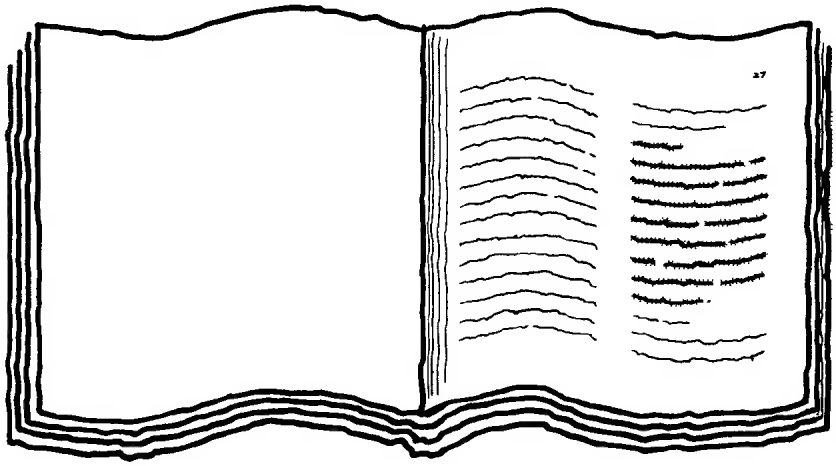
Symbols

27C
56B
131B
134A
148B
151C

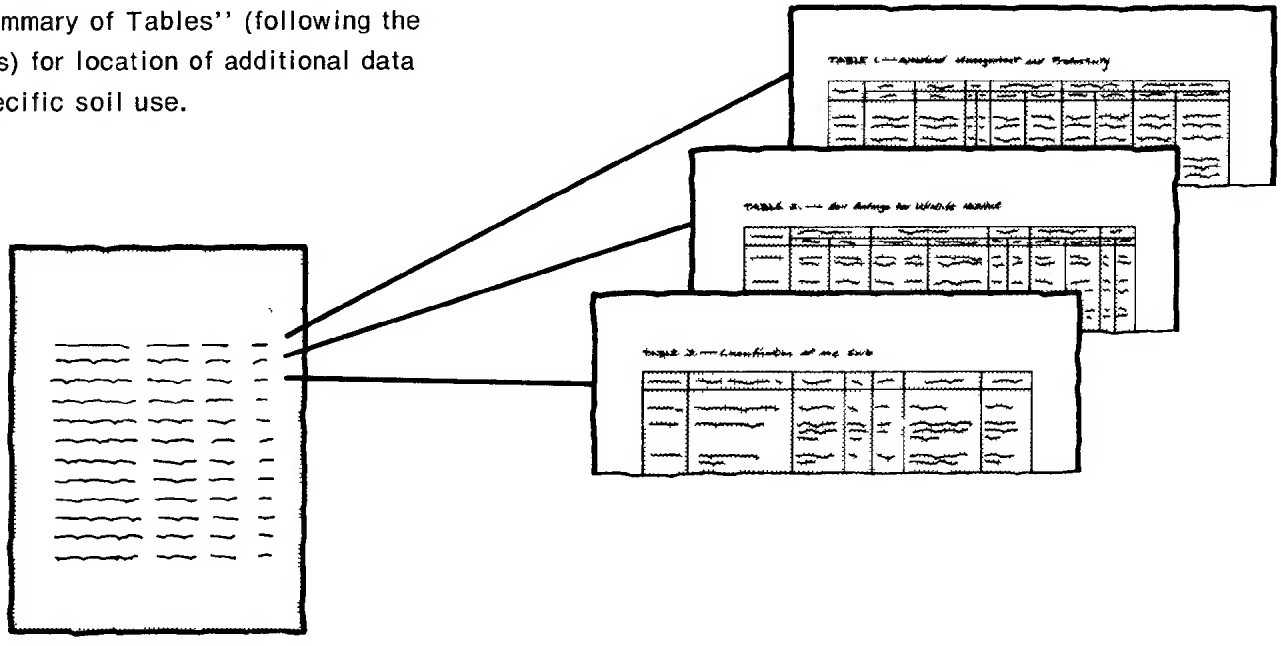
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.





6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists, for planners, community decision makers, engineers, developers, builders, or homebuyers, for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1967-73. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1973. This survey was made cooperatively by the Soil Conservation Service and the University of California Agricultural Experiment Station. It is part of the technical assistance furnished to the Placer County Resource Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

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Issued July 1980

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Summary of Tables

Preface

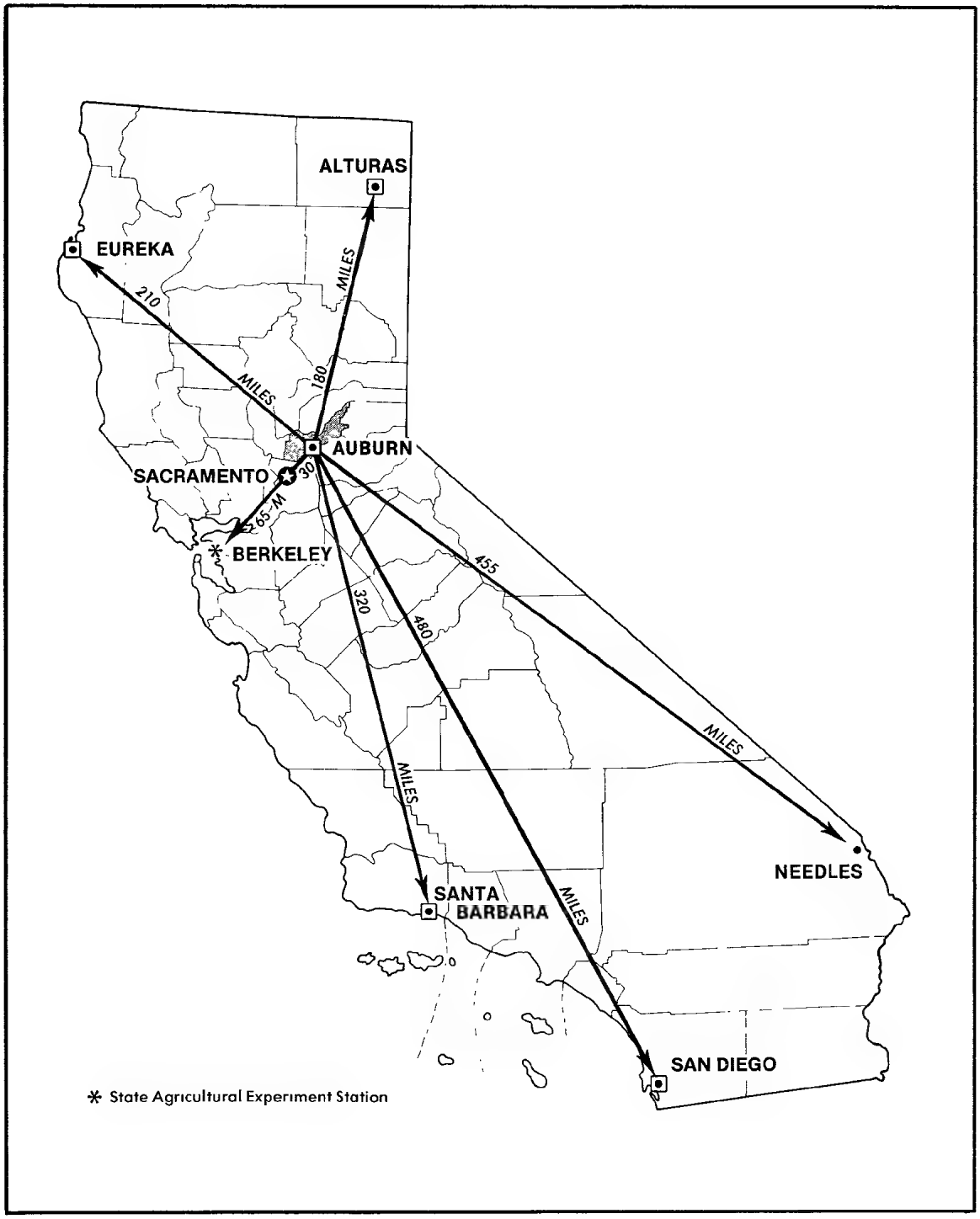
The Soil Survey of Placer County, Western Part, contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.



Location of Placer County in California, Western Part.

SOIL SURVEY OF PLACER COUNTY, CALIFORNIA

WESTERN PART

By John H. Rogers, Soil Scientist, Soil Conservation Service

Fieldwork by John H. Rogers, Paul G. Nazar, Harold R. Sketchley, Lynn A. Brittan, George F. Kliewer
Grant M. Kennedy, Thomas M. Ryan, and Charles B. Goudey
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with the
University of California Agricultural Experiment Station

PLACER COUNTY, WESTERN PART, is in the east-central part of California (see map on facing page). Most of the privately owned land in the county is in the survey area. The total area is 411,544 acres.

Placer County, Western Part, is bounded by Sacramento and Sutter Counties on the west, the Bear River on the north, the Tahoe National Forest on the east, and the Middle Fork of the American River on the south. Elevations range from about 50 feet in the west to 5,000 feet in the east. Auburn is the county seat, and Roseville, population of about 20,000, the largest city.

Farming is of considerable importance in the survey area. The main crops in the western third are small grain, rice, and irrigated pasture. The crops in the central part are deciduous orchards and irrigated pasture. The acreage used for crops in the central part has been reduced by urban expansion. Livestock are important in the western two-thirds of the survey area, where forage is abundant. Wood crops are produced in the eastern third of the survey area.

General nature of the county

The following paragraphs contain general information about Placer County, Western Part. They describe the physiography, relief, and drainage, the climate, the history, the farming, and the water development in the area.

Physiography, relief, and drainage

Placer County, Western Part, is in the eastern part of the Great Valley of California and in the western part of the Central Sierra Nevada Mountains. The Great Valley area is dominantly nearly level to rolling old valley fill. The Sierra Nevada area is dominantly steep dipping, faulted, and folded metamorphic rocks that have been intruded by several types of igneous rocks. Overlying the bedrock in many places is a mantle of river gravel and volcanic debris.

The ascent from the Central Valley is gentle, and the average slope through a west-to-east transect is about 5 percent. In general, the trend of the ridges and rock formations is northwest by southeast. Drainage is generally toward the southwest. The drainage channels have cut through geologic formations and followed the westward tilting of the Sierran fault block. The headward parts of the major streams and rivers are more deeply gouged by river canyons and drainageways than the rolling foothills, where river cutting is less. Typically, the folded and faulted areas of metamorphic rocks are steep and angular, the granitic areas are rounded and smooth and have a basinlike appearance, and the volcanic areas are flat topped and smooth.

The survey area is drained mainly by the Middle and North Forks of the American River and the Bear River. These rivers join the Sacramento River and flow into the San Francisco Bay. There are many major perennial streams in these major drainage areas.

Climate

By Robert Elford, climatologist for California, National Weather Service, U S Department of Commerce

Placer County, Western Part, is an area of abundant sunshine in summer, moderate to heavy precipitation in winter, and a wide temperature range. The strong flow of marine air from the Pacific Ocean in winter results in heavy precipitation, particularly at intermediate elevations in the mountains. At high elevations, much of the precipitation falls as snow, providing a water supply that lasts into summer. Precipitation in summer is light and generally is limited to a few scattered thundershowers at the highest elevations.

Temperatures range from hot on the terraces of the Sacramento Valley in summer to very cold in some of the high mountain areas in midwinter. All of the survey

area experiences freezing temperatures at some time during the year.

The Sierra Nevada Range largely determines the climate of Placer County, Western Part. Differences in elevations affect both temperature and precipitation. On the western slopes of the mountain, precipitation tends to increase with increasing elevation up to about 6,000 feet, but slowly decreases above that level. Temperatures also decrease with elevation. Some of the valleys, however, are cooler than the slopes above them at night because of cold air drainage.

The average annual air temperature in Placer County, Western Part, ranges from about 62 degrees F at the lower elevations to about 55 degrees at the higher elevations toward the east (fig. 1). The average minimum temperature in January decreases from about 39 degrees at the lower elevations to about 27 degrees at the higher elevations. The average maximum temperature in July decreases from about 96 degrees at the lower elevations to about 80 degrees at the higher elevations.

The growing season, which is the interval between the last temperature of 32 degrees or lower in spring and the first in fall, ranges from about 180 to 280 days. The average date of the last freezing temperature in spring is about the first of March at the lower elevations and about the end of May at the higher elevations. In fall, the average date of the first freezing temperature ranges from the middle of October in the eastern part of the area to the first of December in the western part. The growing season also is affected by local variations in terrain and air drainage. The average length of the growing season is shown in figure 2.

Precipitation in the driest part of the survey area is about 18 inches. Precipitation increases with increasing elevation toward the east and averages about 60 inches per year in the wettest part (fig. 3).

History

The term "placer," used in Spanish countries, designates surface mining. The county was formed in April 25, 1851, from parts of Sutter and Yuba Counties. Many mining communities developed. Auburn, an early mining camp founded in 1849, became the county seat and a turnpike and railroad hub. Today it is a modern highway center.

Farming

The history and development of Placer County started with the discovery of gold in 1848 near Ophir in Auburn Ravine. The food needs of the mining population spurred the growth of agriculture By 1856, about 5,884 acres was under cultivation As mining activity later declined, substantial acreages were cultivated in the valley and foothill areas.

The fruit acreage had reached 35,000 to 40,000 acres by the mid-1930's. In recent years this acreage has declined. Currently, fruit plantings cover approximately 6,000 acres, a drop of about 80 percent. This decrease is the result largely of multiple economic factors and a decline in pear growing that began in 1959-1960.

Livestock and poultry production increased from the 1930's and now accounts for 50 percent of the farm income. Deciduous fruits and nuts account for 15 percent, and field crops for 20 percent. Livestock production is the chief enterprise. Its boost to the economy is based in large part on the use of large acreages that are not suitable for more intensive use.

Farming is of considerable importance in the western half of the survey area. The acreage used for crops in the central part of this western half has been reduced by urban expansion. The main crops in the western third of this area are small grain, rice, and irrigated pasture. The crops in the central part of this western half are deciduous orchards and irrigated pasture. Livestock is produced throughout the county where forage is available, but mainly in the western third. Wood crops are produced in the eastern two-thirds of the survey area.

The irrigated acreage totals about 40,000 acres. About 24,000 of this total is irrigated pasture. The potential acreage that can be irrigated in Placer County is about 160,000 acres.

The four areas of greatest potential for Placer County agriculture are (1) the acreage in apples and walnuts on the deep Aiken soils at elevations of 2,000 to 3,500 feet, (2) an expanded and more intensively farmed field and forage crops industry in the western part of the county, (3) range improvement and forage production for an expanding livestock industry, and (4) multiple land use of livestock, timber, Christmas tree production, water, conservation, and recreation.

The Placer County Soil Conservation District of 133,772 acres was organized in 1947. Now it includes the entire county

Water development

The development of water in Placer County began with the discovery of gold. The water was used for ground sluicing and hydraulic mining for profitable gold recovery. Large volumes of water were diverted from rivers and streams and conveyed by ditches to various mining operations

By the 1880's the existing mining ditches for irrigation were utilized in orchards. Since then, additional water for farming has been developed from the four major rivers in the county—the Bear River along the northern boundary of the county, the North and Middle Forks of the American River along the southern part of the county to Folsom Lake, and the South Fork of the Yuba River. The Nevada Irrigation District and the Pacific Gas and Electric Company import 380,000 acre-feet of water through

the Bowman-Spaulding system. Water exports are 50,000 acre-feet to Nevada County and 1.5 million acre-feet to the Folsom Powerhouse, the Natomas Water Company, and the Folsom State Prison.

Sources of available water in Placer County are the Nevada Irrigation District, the Pacific Gas and Electric Company, the South Sutter Water District, the Camp Far West Irrigation District, the San Juan Suburban Water District, and the ground water sources limited to the valley area. A future water source will be the Placer County Water Agency via the Auburn dam.

The State Department of Water Resources projected annual water requirements for the district area in the year 2020 are irrigation 140,000 acre-feet, residential farms 85,000 acre-feet, and urban areas 41,000 acre-feet.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The 12 map units in this survey area have been grouped into three physiographic regions—terraces and alluvial bottoms, foothills, and mountainous uplands. Each group and its map units are described on the pages that follow.

Soils on terraces and alluvial bottoms

The five map units in this group, about 30 percent of the survey area, are on terraces and alluvial bottoms in

the western third of the area. Most of the terrace soils are well drained, are moderately deep to deep over a claypan or hardpan, and have a sandy loam or loam surface layer and a dense clay subsoil. The soils on alluvial bottoms are very deep. They have a sandy loam or loam surface layer and a sandy loam to clay subsoil.

Elevations range from 50 to 250 feet. The average annual precipitation ranges from 14 to 25 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is 260 to 285 days.

These units are used mostly for annual range and winter grain. Some areas are used for irrigated pasture and rice.

1. San Joaquin-Cometa

Undulating, moderately deep and deep, well drained soils that have a dense clay subsoil; on terraces

Most of this unit is north of Auburn Ravine and west of Lincoln. The soils formed in alluvium from mixed but predominantly granitic alluvium. In much of the unit, they are moderately deep over a hardpan. Slopes are 1 to 5 percent. The plant cover is annual grasses and forbs. Elevations range from 50 to 200 feet.

This unit makes up about 7 percent of the survey area. It is about 45 percent San Joaquin soils, 30 percent Cometa soils, and 25 percent Alamo, Fiddyment, Kilaga, and Ramona soils and Xerofluvents, hardpan substratum.

San Joaquin soils are moderately deep over a hardpan. The surface layer is reddish yellow sandy loam. The subsoil is reddish yellow and yellowish red dense clay underlain at about 35 inches by a silica indurated pan. Depth to the dense clay is 12 to 24 inches.

Cometa soils are deep over compacted sediments. The surface layer is brown sandy loam. The subsoil is brown dense clay. Depth to the dense clay is 10 to 22 inches. At a depth of about 24 inches is compacted sandy loam.

This unit is used mostly for winter grain and annual range. Small areas are used for irrigated pasture and rice.

2. Fiddyment-Cometa-Kaseberg

Undulating to rolling, deep to shallow, well drained soils that are underlain by siltstone; on terraces

Most of this map unit is south of Auburn Ravine and west of State Route 65. The Cometa soils formed in mixed but predominantly granitic alluvium deposited over some of the siltstone from which the Fiddyment and Kaseberg soils were derived. Fiddyment and Kaseberg soils are shallow to moderately deep over a hardpan. Slopes are 1 to 9 percent. The plant cover is annual grasses and forbs. Elevations range from 50 to 200 feet.

This unit makes up about 11 percent of the survey area. It is about 40 percent Fiddyment soils, 30 percent Cometa soils, 10 percent Kaseberg soils, and 20 percent Alamo, Ramona, and San Joaquin soils.

Fiddyment soils are moderately deep over a hardpan. The surface layer is light yellowish brown loam. The subsoil is brown and yellowish brown dense clay loam underlain at about 28 inches by a silica indurated hardpan. Depth to the dense clay loam is 12 to 22 inches. Depth to the indurated hardpan is 20 to 37 inches.

Cometa soils are deep. The surface layer is brown sandy loam. The subsoil is brown dense clay. Depth to the dense clay is 10 to 22 inches. At a depth of about 24 inches is compacted sandy loam.

Kaseberg soils are shallow over a hardpan. The surface layer is light brownish gray loam. The subsoil is pale brown loam over light gray silt loam. Depth to the silica indurated siltstone is 10 to 20 inches.

This unit is used mostly for winter grain and annual range. Small areas are used for irrigated pasture and rice.

3. Cometa-Ramona

Undulating, deep and very deep, well drained soils; on terraces

This map unit occurs as narrow bands in the Lincoln and Roseville areas. The soils formed in mixed but predominantly granitic alluvium. The Ramona soils formed in younger alluvium that overlies the Cometa soils as ridges. Slopes are 1 to 9 percent. The plant cover is annual grasses, forbs, and scattered oak. Elevations range from 75 to 200 feet.

This unit makes up about 4 percent of the survey area. It is about 45 percent Cometa soils, 30 percent Ramona soils, and 25 percent Alamo, Fiddyment, Kilaga, and San Joaquin soils.

Cometa soils are deep. The surface layer is brown sandy loam. The subsoil is brown dense clay. Depth to the dense clay is 10 to 22 inches. At a depth of about 24 inches is compacted sandy loam.

Ramona soils are very deep. The surface layer is brown sandy loam and light brown loam. The subsoil is mixed reddish yellow and yellowish red sandy clay loam over reddish yellow gravelly sandy loam.

This unit is used mostly for winter grain. Some areas are used for irrigated crops, orchards, and pasture.

4. Xerofluvents-Kilaga-Ramona

Nearly level, very deep, well drained to somewhat poorly drained soils, on alluvial bottoms

This map unit is mainly along Auburn Ravine, Coon Creek, and the Bear River. The soils formed in very deep alluvium derived from mixed sources. Slopes are 0 to 2 percent. The plant cover is annual grasses, forbs, cottonwood, willow, and oak. Elevations range from 50 to 200 feet.

This unit makes up about 5 percent of the survey area. It is about 40 percent Xerofluvents, 30 percent Kilaga soils, 10 percent Ramona soils, and 20 percent mainly Alamo, Cometa, and San Joaquin soils and Riverwash.

Xerofluvents are moderately well drained or somewhat poorly drained and are subject to occasional to frequent flooding. They vary in texture from sands to clay loams and in places are gravelly.

Kilaga soils are very deep and well drained. The surface layer is strong brown loam. The subsoil is reddish brown clay loam and clay.

Ramona soils are very deep and well drained. The surface layer is brown sandy loam and light brown loam. The subsoil is mixed reddish yellow and yellowish red sandy clay loam over reddish yellow gravelly sandy loam.

This unit is used mostly for irrigated crops and pasture. Some areas, particularly those adjacent to streams and rivers, are subject to occasional to frequent flooding.

5. Redding-Corning

Undulating to rolling, moderately deep and very deep, well drained soils that have a dense clay subsoil; on high terraces

This map unit is near Sheridan. The soils formed in old gravelly alluvium from mixed sources. In many places, they are moderately deep over a silica indurated hardpan. Slopes are 2 to 15 percent. The plant cover is annual grasses and forbs. Elevations range from 100 to 240 feet.

This unit makes up 3 percent of the survey area. It is about 85 percent Redding and Corning soils and 15 percent Cometa, Fiddyment, and San Joaquin soils.

Redding soils are moderately deep over a claypan and indurated sediment. The surface layer is strong brown gravelly loam. The subsoil is reddish brown dense clay underlain at 28 inches by a silica indurated pan. Depth to the dense clay is 10 to 17 inches.

Corning soils are very deep. The surface layer is reddish brown gravelly loam. The subsoil is red dense clay underlain by strong brown clay loam. Depth to the dense clay is 12 to 22 inches.

This unit is used mostly for annual range. Some areas are used for winter grain and irrigated pasture.

Soils on foothills

The three units in this group, about 36 percent of the Placer survey area, are undulating to very steep uplands in the central third of the area. They are somewhat excessively drained to well drained gravelly coarse sandy loams to silt loams

Elevations range from 200 to 1,600 feet. The average annual precipitation ranges from 18 to 36 inches The average annual air temperature ranges from 60 to 62 degrees F. The average frost-free season is between 230 and 270 days.

These units are used mostly for annual range. Some of the acreage in orchards in the Loomis Basin is being converted to rural ranchettes. Also, some of the acreage is irrigated pasture.

6. Exchequer-Inks

Undulating to steep, well drained and somewhat excessively drained soils that are shallow over volcanic rock

Most of this map unit is on ridges near Newcastle, Roseville, and Lincoln. The soils formed in cobbly material weathered from andesitic conglomerate and breccia. Slopes are 2 to 50 percent. The plant cover is annual grasses, blue oak, and live oak. Elevations range from 100 to 1,200 feet.

This unit makes up about 6 percent of the survey area. It is about 45 percent Exchequer soils, 25 percent Inks soils, and 30 percent the Alamo variant, Andregg, Caperton, and Inks variant soils and Rock outcrop.

Exchequer soils are somewhat excessively drained. They are brown very stony loams and cobbly loams 8 to 20 inches deep over hard andesitic breccia.

Inks soils are well drained. The surface layer is yellowish brown cobbly loam. The subsoil is brown very cobbly loam underlain at 12 to 20 inches by andesitic conglomerate.

This unit is used mainly for annual range. A few areas are used for irrigated pasture and deciduous orchards.

7. Andregg-Caperton-Sierra

Undulating to steep, well drained and somewhat excessively drained soils that are deep to shallow over granitic rock

Most of this map unit is in the Loomis Basin. The soils formed in material weathered from granitic rock. Slopes are 2 to 50 percent. The plant cover is annual grasses and blue and live oak. Elevations range from 200 to 1,000 feet.

This unit makes up about 15 percent of the survey area. It is about 50 percent Andregg soils, 20 percent Caperton soils, 10 percent Sierra soils, and 20 percent Shenandoah soils and Rock outcrop.

Andregg soils are moderately deep and well drained. The surface layer is grayish brown coarse sandy loam. The subsoil is pale brown coarse sandy loam that is underlain at a depth of 24 to 40 inches by weathered granitic rock.

Caperton soils are shallow and somewhat excessively drained. The surface layer is dominantly grayish brown gravelly coarse sandy loam. The underlying material is pale brown gravelly coarse sandy loam that is underlain at a depth of 8 to 20 inches by weathered granitic rock.

Sierra soils are deep and well drained. The surface layer is dark grayish brown and brown sandy loam. The subsoil is yellowish red and red sandy clay loam and

clay loam that is underlain at a depth of 40 to 80 inches by weathered granitic rock.

This unit is used mostly for deciduous orchards and irrigated pasture. Many of the orchards are being subdivided into rural ranchettes.

8. Auburn-Sobrante

Undulating to very steep, well drained soils that are shallow or moderately deep over metamorphic rock

Most of this map unit occurs as a wide belt from Auburn northwest to Camp Far West Reservoir. The soils formed in material weathered from metabasic and metasedimentary rock. Slopes are 2 to 70 percent. The plant cover is annual grasses, oak, and scattered brush and pine. Elevations range from 200 to 1,600 feet.

This unit makes up about 15 percent of the survey area. It is about 55 percent Auburn soils, 20 percent Sobrante soils, and 25 percent Argonaut and Boomer soils and Rock outcrop.

Auburn soils are shallow and well drained. The surface layer is strong brown silt loam. The subsoil is yellowish red silt loam that is underlain at a depth of 12 to 28 inches by partly weathered basic schist.

Sobrante soils are moderately deep and well drained. The surface layer is yellowish red silt loam. The subsoil is yellowish red heavy loam that is underlain at 22 to 40 inches by hard basic schist.

This unit is used mostly for annual range, watershed, and habitat for wildlife. Some areas are used for irrigated pasture and orchards.

Soils on mountainous uplands

The four map units in this group, about 34 percent of the Placer survey area, are undulating to very steep uplands in the eastern third of the area. They are well drained sandy loams and loams.

Elevations range from 1,200 to 5,300 feet. The average annual precipitation ranges from 35 to 60 inches, some of which falls as snow. The average annual air temperature ranges from 50 to 59 degrees F. The average frost-free season is between 130 and 250 days.

These units are used mostly for timber production or watershed. A few areas are used for irrigated pasture and orchards.

9. Mariposa-Josephine-Sites

Undulating to steep, well drained soils that are shallow to deep over metamorphic rock

This map unit occurs throughout the eastern third of the survey area. The soils formed in material weathered from metamorphic rock. Because of the vertical uplifting of the parent rock, its mixed mineralogy, and the varying degree of metamorphism, these soils are highly variable within short horizontal distances. Slopes are 2 to 50 percent. The plant cover is conifer-hardwood forest and scattered brush. Elevations range from 1,500 to 4,500 feet.

This unit makes up about 16 percent of the survey area. It is about 40 percent Mariposa soils, 30 percent Josephine soils, 15 percent Sites soils, and 15 percent Boomer and Boomer variant soils and Rock outcrop.

Mariposa soils are shallow to moderately deep. The surface layer is brown gravelly loam. The subsoil is reddish yellow gravelly clay loam that is underlain at 15 to 35 inches by fractured slate.

Josephine soils are deep. The surface layer is brown and dark reddish brown loam. The subsoil is reddish yellow clay loam that is underlain at 40 to more than 60 inches by weathered slate.

Sites soils are deep. The surface layer is dark reddish brown loam. The subsoil is red clay that is underlain at 40 to more than 60 inches by soft schistose.

This unit is used mainly for timber production. Some areas have been cleared and are used for orchards.

10. Maymen-Mariposa

Hilly to very steep, well drained and somewhat excessively drained soils that are shallow or moderately deep over metamorphic rock

This map unit is on the canyons of major drainageways in the eastern third of the survey area. The soils formed in material weathered from hard metamorphic rock. Slopes are 30 to 70 percent. The plant cover is brush and scattered stunted conifer and hardwood. Elevations range from 1,200 to 3,500 feet.

This unit makes up about 8 percent of the survey area. It is about 50 percent Maymen soils, 25 percent Mariposa soils, and 25 percent Rock outcrop and Josephine soils.

Maymen soils are shallow and somewhat excessively drained. They are brown and yellowish brown gravelly loams that are underlain at 8 to 20 inches by hard slate.

Mariposa soils are shallow to moderately deep and well drained. The surface layer is brown gravelly loam. The subsoil is reddish yellow gravelly clay loam that is underlain at 15 to 35 inches by fractured slate.

This unit is used for watershed.

11. Cohasset-Aiken-McCarthy

Undulating to steep, well drained soils that are moderately deep to very deep over volcanic rock

Most of this map unit occurs as three broad ridges in the eastern part of the survey area—the Dutch Flat-Alta, the Iowa Hill, and the Foresthill areas. The soils formed in material weathered from andesitic conglomerate. They are on broad, sloping, tabular ridges with steep side slopes. Slopes are 2 to 50 percent. The Aiken and most of the Cohasset soils are on the ridges. The McCarthy and the rest of the Cohasset soils are on the side

slopes. The plant cover is conifer-hardwood forest. Elevations range from 2,000 to 5,300 feet.

This unit makes up about 9 percent of the survey area. It is about 40 percent Cohasset soils, 30 percent Aiken soils, 20 percent McCarthy soils, and 10 percent Horseshoe and Iron Mountain soils.

Cohasset soils are deep. The surface layer is dark brown cobbly loam. The subsoil is yellowish red and strong brown cobbly clay loam that is underlain at 40 to more than 80 inches by weathered andesitic conglomerate.

Aiken soils are very deep. The surface layer is brown and yellowish red loam. The subsoil is yellowish red clay loam and red clay that is underlain at 60 to 94 inches by weathered andesitic conglomerate.

McCarthy soils are moderately deep. The surface layer is brown cobbly sandy loam. The subsoil is strong brown and reddish yellow very cobbly sandy loam that is underlain at 22 to 40 inches by andesitic conglomerate.

This unit is used mainly for timber production.

12. Dubakella-Rock outcrop

Rolling to steep, well drained soils that are moderately deep over serpentine; also Rock outcrop

This map unit occurs as small scattered tracts throughout the eastern half of the survey area. Slopes are 9 to 50 percent. The plant cover is sparse brush and digger pine. Elevations range from 1,200 to 4,000 feet.

This unit makes up about 1 percent of the survey area. It is about 50 percent Dubakella soils, 40 percent Rock outcrop, and 10 percent Henneke soils, which occur as two small tracts north of Auburn.

Dubakella soils are moderately deep. The surface layer is reddish brown very stony loam. The subsoil is brown cobbly clay underlain at 21 to 33 inches by serpentine rock.

Rock outcrop consists of areas of hard serpentine and other ultrabasic rock formations. Rock outcrop and stones cover 50 to 90 percent of the surface. There is a thin mantle of soil material in crevices.

This unit is used mainly for watershed. Some areas provide a source of rock for roads. In other areas the rock is mined for chrome.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Aiken loam, 2 to 9 percent slopes, is one of several phases within the Aiken series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Alamo-Fiddyment complex is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them. Redding and Corning gravelly loams is an undifferentiated group in this survey area.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Riverwash is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

Not all units in the survey area have been mapped with the same degree of precision. Broadly defined units indicated by an asterisk, are likely to be larger and to vary more in composition than units mapped in greater detail. Composition has been controlled well enough, however, for the expected use of the soils.

The acreage and proportionate extent of each map unit are given in table 1, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions

The management described in each map unit represents the optimum level of management in the area. Optimum management is that level of management under which the highest possible yields are obtained.

100—Aiken loam, 2 to 9 percent slopes. This is a very deep, well drained soil underlain by weathered andesitic rock. It formed in residuum on long, broad volcanic ridges at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 57 degrees F. The average frost-free season is between 200 to 250 days. Natural vegetation is conifer-hardwood forest.

About 8 percent of the acreage is included areas of Cohasset loam, 5 percent McCarthy cobbly sandy loam, and 3 percent Horseshoe gravelly loam.

Typically, the surface layer of this Aiken soil is brown and yellowish red loam about 21 inches thick. The upper 27 inches of the subsoil is yellowish red clay loam. The lower part to a depth of 86 inches is red clay.

Permeability is moderately slow. The available water capacity is 9.0 to 10.5 inches. The effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion is slight.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and by using cover crops in orchards in winter. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Aiken soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management. It is capable of producing about 152 cubic feet, or 947 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards and vineyards.

The construction of vacation homes is increasing on this Aiken soil. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction

can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability.

Capability units IIe-1(22) irrigated, IIIe-1(22) nonirrigated; Storie index 69.

101—Aiken loam, 9 to 15 percent slopes. This is a very deep, well drained soil underlain by weathered andesitic rock. It formed in residuum on volcanic ridges at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 200 and 250 days. Natural vegetation is conifer-hardwood forest.

About 10 percent of the acreage is included areas of Cohasset loam, and 8 percent McCarthy cobbly sandy loam.

Typically, the surface layer of this Aiken soil is brown and yellowish red loam about 21 inches thick. The upper 27 inches of the subsoil is yellowish red clay loam. The lower part to a depth of 86 inches is red clay.

Permeability is moderately slow. The available water capacity is 9.0 to 10.5 inches. The effective rooting depth is 60 inches or more. Runoff is medium. The hazard of erosion is moderate when the soil is bare.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and by using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Aiken soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management. It is capable of producing about 152 cubic feet, or 947 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife population, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards and vineyards.

The construction of vacation homes is increasing on this Aiken soil. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability.

Capability unit IIIe-1(22) irrigated and nonirrigated; Storie index 61.

102—Aiken cobbly loam, 2 to 15 percent slopes. This is a very deep, well drained cobbly soil underlain by weathered andesitic rock. It formed in residuum on long, broad volcanic ridges and side slopes at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 200 and 250 days. Natural vegetation is conifer-hardwood forest.

About 8 percent of the acreage is included areas of Cohasset cobbly loam, 5 percent McCarthy cobbly sandy loam, and 3 percent Horseshoe gravelly loam.

Typically, the surface layer of this Aiken soil is brown and yellowish red cobbly loam about 21 inches thick. The upper 27 inches of the subsoil is yellowish red cobbly clay loam. The lower part to a depth of 86 inches is red cobbly clay.

Permeability is moderately slow. The available water capacity is 8.0 to 10.0 inches. The effective rooting depth is 60 inches or more. Surface runoff is medium. The hazard of erosion is moderate.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. Cobbles make cultivation difficult. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well-prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinkler at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Aiken soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management. The cobbles do not restrict tree growth. This soil is capable of producing about 152 cubic feet, or 947 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife production, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards and vineyards.

The construction of vacation homes is increasing on this Aiken soil. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability.

Capability unit IIIe-7(22) irrigated and nonirrigated; Storie index 46.

103—Aiken cobbly loam, 15 to 30 percent slopes. This is a very deep, moderately steep, well drained cobbly soil underlain by weathered andesitic rock. It formed in residuum on the sides of volcanic ridges. Elevations are 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 225 days. Natural vegetation is conifer-hardwood forest.

About 15 percent of the acreage is included areas of Cohasset cobbly loam, and 10 percent McCarthy cobbly sandy loam. This unit also includes small scattered areas of Iron Mountain cobbly sandy loam.

Typically, the surface layer of this Aiken soil is brown and yellowish red cobbly loam about 21 inches thick. The upper 27 inches of the subsoil is yellowish red cobbly clay loam. The lower part to a depth of 86 inches is red cobbly clay.

Permeability is moderately slow. The available water capacity is 8.0 to 10.0 inches. The effective rooting depth is 60 inches or more. Surface runoff is rapid. The hazard of erosion is moderate or high.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by using permanent cover in orchards. Cultivation to establish permanent cover should be across the slope. Orchards should be planted and worked across the slope. To avoid compaction, this soil should not be worked when wet. Cobbles and slope make cultivation difficult. Sprinklers should be used in irrigating.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Aiken soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management. The cobbles do not restrict tree growth. This soil is capable of producing about 152 cubic feet, or 947 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 12 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards and vineyards.

The construction of vacation homes is increasing on this Aiken soil. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability to support a load. Dwelling and road construction can be designed to offset the shrink-swell potential and the limited ability to support a load. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope and the moderately slow permeability.

Capability unit IVe-7(22) irrigated and nonirrigated; Storie index 37.

104—Alamo-Fiddyment complex, 0 to 5 percent slopes. These nearly level to undulating soils are on low terraces at elevations of 50 to 130 feet. The unit is about 50 percent Alamo soil and 30 percent Fiddyment soil. The Alamo soil is in nearly level basins and drainageways, and the Fiddyment soil is on side slopes and ridges. The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses, forbs, and weeds.

About 10 percent of this unit is included areas of San Joaquin sandy loam, 5 percent Cometa sandy loam, and 5 percent Kaseberg loam.

The Alamo soil is a poorly drained clay that is moderately deep over a hardpan. It has slopes of 0 to 2 percent. It formed in fine textured alluvium from mixed sources.

Typically, the surface layer is dark gray mottled clay about 9 inches thick. The underlying material is dark gray and dark grayish brown, neutral and mildly alkaline clay. At a depth of about 37 inches is a hardpan.

Permeability is very slow. The available water capacity is 2.5 to 6.0 inches. The effective rooting depth is 20 to 40 inches. The water table is near the surface from winter to early in spring. Surface runoff is slow or ponded. The hazard of erosion is slight.

The Fiddyment soil is well drained and is moderately deep over a hardpan. It formed in old valley fill indurated siltstone or sandstone.

Typically, the surface layer is light yellowish brown loam and silt loam about 12 inches thick. The subsoil is brown and yellowish brown dense clay loam. At a depth of 28 inches is a hardpan. At 35 inches is hard sandstone. In a few places, the surface layer is fine sandy loam.

Permeability is very slow. The available water capacity is 2.0 to 3.5 inches. The effective rooting depth is 20 to 37 inches. The dense subsoil restricts roots, reducing the available water to plants. Surface runoff is slow. The erosion hazard is slight. The soil is saturated for short periods following intense rainstorms.

Most areas of this unit are used for dryland winter grains, irrigated pasture, and rice.

To avoid compaction, these soils should not be cultivated or equipment moved across them when wet, except in growing rice. Flood, border, or sprinkler irrigation is suitable.

When grain is grown, these soils are usually fallowed in alternate years to conserve moisture and control weeds. The low yields can be improved with applications of nitrogen, especially when it is applied in both nitrate and ammonia form. Yields are sometimes reduced by water ponding on the Alamo soil.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Goars tall fescue. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping. The pasture responds to applications of nitrogen and phosphorus. Leveling for border irrigation may expose a hardpan. The frequency of irrigation is about every 5 to 8 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

Flatter areas of this unit are well suited to rice production. The soils should be leveled so that water ponds. The hardpan is nearly impervious to the downward movement of the water. Water requirements for rice are about 1 cubic foot per second for 40 acres after the checks are flooded. Rice should be rotated with barley every 2 to 4 years to help control aquatic weeds and soil fungus.

Grainfields have limited potential as habitat for mourning dove. Irrigated pasture and ricefields provide habitat for dove and pheasant. Ricefields provide good habitat for duck. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This unit supports little construction except for farmsteads. The major limitations to construction on the Alamo soil are wetness, the very slow permeability of the subsoil, the shrink-swell potential, and the limited ability to support a load. The major limitations to construction on the Fiddyment soil are the very slow permeability of the subsoil, the shallow depth to hardpan, and the limited ability of the soil to support a load. Farmsteads should be on the Fiddyment soil to avoid the problems of wetness and shrink swell. Septic tank absorption fields may not function properly because of wetness, the very slow permeability, and a hardpan within 40 inches of the surface.

Capability unit IVw-5(17) irrigated and nonirrigated; Storie index 22.

105—Alamo Variant clay, 2 to 15 percent slopes. This is a moderately deep, gently sloping, somewhat poorly drained clay on alluvial bottoms and rolling foot slopes in valleys between volcanic ridges. It formed over alluvium from mixed sources and colluvium and residuum from volcanic mudstone and andesite. Elevations are 100 to 200 feet. The average annual precipitation ranges from 20 to 25 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is about 250 days. Natural vegetation is annual grasses and forbs.

About 10 percent of the acreage is included areas of a clay 10 to 20 inches deep over volcanic mudstone. On about 20 percent of the acreage, the surface of the Alamo variant is about 10 percent chert and andesite cobbles.

Typically, the surface layer of the Alamo variant is black and very dark gray clay about 25 inches thick. The underlying material is variegated very dark grayish brown and grayish brown, calcareous sandy clay. At a depth of about 36 inches is weathered volcanic mudstone.

Permeability is very slow. The available water capacity is 4.5 to 9.5 inches. The effective rooting depth is 36 to 60 inches. The water table rises to within 10 to 30 inches of the surface during the winter and early in spring. Surface runoff is slow to medium. The hazard of erosion is slight to moderate.

This soil is used mainly for annual rangeland. A few areas are being subdivided for homesites.

This soil has good potential for rangeland. Forage can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch, and improved perennial dryland grasses, such as Perlagrass. They should be planted in a well prepared seedbed. In a favorable year, the green feed period is from March 15 to June 15. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. They respond to applications of nitrogen, phosphorus, and sulfur.

This soil has good potential as habitat for quail and mourning dove. The lack of shrub cover is the most limiting factor for good wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

The major limitations to urban use are wetness, the very slow permeability of the subsoil, the shrink-swell potential, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset these limitations. Septic tank absorption fields may not function properly because of the wetness and the very slow permeability of the subsoil. Community sewage systems should be anticipated for medium and high density subdivisions.

Capability unit IIIe-5(17) nonirrigated; Storie index 31.

106—Andregg coarse sandy loam, 2 to 9 percent slopes. This is a moderately deep, gently rolling, well drained soil underlain by weathered granitic bedrock. It formed in residuum on low hills in the Loomis Basin.

Elevations are 200 to 1,000 feet. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 5 percent of the acreage is included areas of a soil that is similar to this Andregg soil but is 35 to 60 inches deep to weathered bedrock and has a light yellowish brown and brown sandy clay loam subsoil; 5 percent is Caperton coarse sandy loam; 5 percent is Sierra sandy loam; 5 percent is a soil that is similar to the Sierra soil but is 20 to 40 inches deep to weathered rock; and 5 percent is a soil that is very similar to this Andregg soil but is 40 to 60 inches deep to weathered bedrock. In some swales and along drainageways, there is a somewhat poorly drained or moderately well drained soil that is otherwise similar to this Andregg soil.

Typically, the surface layer of this Andregg soil is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is medium. The hazard of erosion is moderate.

This soil is used for irrigated pasture, deciduous orchards, and rangeland. Many orchards are being converted to rural or ranchette housing developments.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. To avoid compaction, this soil should not be cultivated or have equipment moved across it when it is wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential for rangeland. Forage can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards.

This soil is used increasingly as sites for rural subdivisions. The major limitation to urban use is the depth to rock. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because the depth to rock is generally less than 40 inches.

Capability unit IIIe-1(18) irrigated and nonirrigated; Storie index 54.

107—Andregg coarse sandy loam, 9 to 15 percent slopes. This is a moderately deep, rolling, well drained soil underlain by weathered granitic bedrock. It formed in residuum on low hills in the Loomis Basin. Elevations are 200 to 1,000 feet. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 5 percent of the acreage is included areas of a soil that is similar to this Andregg soil but is 35 to 60 inches deep to weathered bedrock and has a light yellowish brown and brown sandy clay loam subsoil; 5 percent is Caperton coarse sandy loam; 5 percent is Sierra sandy loam; 3 percent is a soil that is similar to the Sierra soil but is 20 to 40 inches deep to weathered rock; and 3 percent is a soil that is very similar to this Andregg soil but is 40 to 60 inches deep to weathered bedrock. Along the contact areas between the granite and volcanic ridges, the soil surface is modified by

cobbly dark brown loamy colluvium that has moved downslope. Spot symbols denote scattered rock outcrop.

Typically, the surface layer of this Andregg soil is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is medium. The hazard of erosion is moderate.

This soil is used mainly for irrigated pasture, deciduous orchards, and rangeland. Many orchards are being converted to rural or ranchette housing developments.

Erosion can be controlled by cultivating across the slope. Cover crops should be used during the winter. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential for rangeland. Forage can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from March 15 to June 1. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock and the slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because the depth to rock is generally less than 40 inches.

Capability unit IVe-1(18) irrigated and nonirrigated; Storie index 48.

108—Andregg coarse sandy loam, 15 to 30 percent slopes. This is a moderately deep, hilly, well drained soil underlain by weathered granitic bedrock. It formed in residuum in the Loomis Basin. Elevations are 300 to 1,000 feet. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 5 percent of the acreage is included areas of a soil that is similar to this Andregg soil but is 35 to 60 inches deep to weathered bedrock and has a light yellowish brown and brown sandy clay subsoil; 10 percent is Caperton coarse sandy loam; 5 percent is Sierra sandy loam; 5 percent is a soil that is similar to the Sierra soil but is 20 to 40 inches deep to weathered rock; and 3 percent a soil that is very similar to this Andregg soil but is 40 to 60 inches deep to weathered bedrock. Ad hoc symbols denote scattered rock outcrop.

Typically, the surface layer of this Andregg soil is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is medium to rapid. The hazard of erosion is high.

This soil is used mainly for irrigated pasture and rangeland. It also supports deciduous orchards. Many areas are being converted to rural or ranchette housing developments.

Erosion can be controlled by using permanent cover. Orchards should be planted and worked across the slope. This soil should be tilled only to establish improved permanent cover. To avoid compaction, this soil

should not be worked when wet. Sprinklers should be used in irrigating.

In orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential for rangeland. Forage can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Grain provides food. Deer present serious depredation problems in orchards.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock and the slope. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Because of the erodibility of this soil and its parent material, cuts and fills should be on at least a 2 to 1 slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the depth to rock.

Capability subclass VIe(18) irrigated and nonirrigated; Storie index 42.

109—Andregg coarse sandy loam, rocky, 2 to 15 percent slopes. This is a moderately deep, gently rolling and rolling, well drained soil underlain by weathered granitic bedrock. It formed in residuum on low hills in the Loomis Basin Five percent of the area is scattered granitic rock outcrop that ranges from 2 to 10 feet in diameter to large areas covering one-half acre. Elevations are 200 to 1,000 feet. The average precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 5 percent of the acreage is included areas of a soil that is similar to this Andregg soil but is 35 to 60 inches deep to weathered bedrock and has a light yellowish brown and brown sandy clay loam subsoil; 5 percent is Caperton coarse sandy loam; 2 percent is Sierra sandy loam; and 3 percent is a soil that is similar to the Sierra soil but is 20 to 40 inches deep to weathered bedrock. In some swales and along drainageways, there is a somewhat poorly drained or moderately well drained soil that is otherwise similar to this Andregg soil.

Typically, the surface layer of this Andregg soil is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is medium. The hazard of erosion is moderate.

This soil is used for irrigated pasture, deciduous orchards, and rangeland. Many areas are being converted to rural or ranchette housing developments.

Erosion can be controlled by cultivating across the slope. Cover crops should be used in winter. This soil deepens quickly adjacent to the rocky areas, so farming can be carried out up to the rock. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchard-

grass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential for rangeland. Forage production can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchards and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip plantings of grain provide food. Deer present serious depredation problems in orchards.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock and Rock outcrop. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because the depth to rock is generally less than 40 inches. The rocky areas may dictate the location of building sites.

Capability unit IVe-7(18) irrigated and nonirrigated; Storie index 34.

110—Andregg coarse sandy loam, rocky, 15 to 30 percent slopes. This is a moderately deep, hilly, well drained soil underlain by weathered granitic bedrock. It formed in residuum in the Loomis Basin. Five percent of the area is scattered granitic rock outcrop that ranges from 2 to 10 feet in diameter to large areas covering about one-half acre. Elevations are 300 to 1,000 feet. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 to 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 5 percent of the acreage is included areas of a soil that is similar to this Andregg soil but is 35 to 60 inches deep to weathered bedrock and has a light yellowish brown and brown sandy clay loam subsoil; 10 percent is Caperton coarse sandy loam; 2 percent is Sierra sandy loam; 3 percent is a soil that is similar to the Sierra soil but is 20 to 40 inches deep to weathered rock; and 5 percent is a soil that is very similar to this Andregg soil but is 40 to 60 inches deep to weathered bedrock.

Typically, the surface layer of this Andregg soil is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is medium to rapid. The hazard of erosion is high.

This soil is used mainly for rangeland because of the slope and the rock areas. Some areas are used for deciduous orchards and irrigated pasture. Many areas are being converted to rural or ranchette housing developments.

Erosion can be controlled by using permanent cover. Orchards should be planted and worked across the slope. This soil should be tilled only to establish improved permanent cover. Rocky areas interfere with, but do not prevent, farming. To avoid compaction, this soil should not be worked when wet. Sprinklers should be used in irrigating.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential for rangeland. Forage can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock and the slope. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Because of the erodibility of this soil and its parent material, all cuts and fills should be on at least a 2 to 1 slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the depth to rock. They should be located away from rocky areas. The rocky areas may dictate the location of building sites.

Capability subclass VIs(18) irrigated and nonirrigated; Storie index 28.

111—Andregg coarse sandy loam, rocky, 30 to 50 percent slopes. This is a moderately deep, steep, well drained soil underlain by weathered granitic bedrock. It formed in residuum on foothills in the Loomis Basin. Ten percent of the area is granitic rock outcrop that ranges from 2 to 10 feet in diameter to large areas covering about one-half acre. Elevations are 500 to 1,000 feet. The average annual precipitation ranges from 24 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Native vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 15 percent of the acreage is included areas of Caperton coarse sandy loam, generally on the steeper slopes; 2 percent is Sierra sandy loam; and 3 percent is a soil that is similar to the Sierra soil but is 24 to 40 inches deep to weathered bedrock.

Typically, the surface layer of this Andregg soil is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is rapid. The erosion hazard is high.

This soil is used mainly for annual range.

The major limitation to rangeland is the slope. Uniform grazing is difficult to acnieve because livestock tend to trail around the slope. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock and the slope. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Because of the erodibility of this soil and its parent material, all cuts and fills should be on at least a 2 to 1 slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the depth to rock. They should be located away from the rocky areas. The rocky areas may dictate the location of building sites.

Capability subclass VIIs(18) nonirrigated; Storie index 16.

112—Andregg-Rock outcrop complex, 5 to 30 percent slopes. This rolling to hilly soil and Rock outcrop are on granitic uplands in the Loomis Basin near Folsom Lake. This unit is about 65 percent Andregg soil and 15 percent granitic Rock outcrop. Elevations are 200 to 1,000 feet. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 5 percent of this unit is included areas of a soil that is similar to this Andregg soil but is 35 to 60 inches deep to weathered bedrock and has a light yellowish brown and brown sandy clay loam subsoil; 10 percent is Caperton coarse sandy loam; 2 percent is Sierra sandy loam; and 3 percent is a soil that is similar to the Sierra soil but is 20 to 40 inches deep to weathered rock.

The Andregg soil is moderately deep and well drained. It formed in residuum of granitic rock.

Typically, the surface layer is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale

brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is medium to rapid. The erosion hazard is moderate to high.

Rock outcrop consists of areas of scattered hard granitic rock ranging in size from 2 to 10 feet in diameter to large areas covering 1/2 to 2 acres.

Surface runoff is very rapid. There is no erosion hazard.

This unit is used mainly for range and rural development.

This unit has good potential for rangeland. The rock outcrop does not appreciably reduce forage production. Forage production can be increased in selected areas by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable grass year, the green feed period is from about March 15 to June 1. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This unit is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock, Rock outcrop, and the slope. In locating roads, special care is needed to minimize the the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Because of the erodibility of this Andregg soil and parent material, all cuts and fills should be on at least a 2 to 1 slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and depth to rock. They should be located away from rocky areas. The rock outcrop limits the location of building sites.

Capability subclass VIs(18) nonirrigated; Storie index 38.

113—Andregg-Shenandoah complex, 2 to 15 percent slopes. These undulating to rolling soils are mainly along the contact of the granitic and terrace soils. Elevations are 200 to 500 feet. The unit is about 55 percent Andregg soil and 30 percent Shenandoah soil. The Andregg soil is on side slopes and ridges, and the Shenandoah soil is in swales and drainageways. The average annual precipitation ranges from 22 to 25 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 to 270 days. Natural vegetation is annual grasses, forbs, and sedges.

About 5 percent of this unit is included areas of Caperton coarse sandy loam, about 5 percent Sierra sandy loam, and 5 percent Xerofluvents, frequently flooded.

The Andregg soil is moderately deep and well drained. It formed in residuum from granitic rock.

Typically, the surface layer is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is medium. The hazard of erosion is moderate.

The Shenandoah is a moderately deep and somewhat poorly drained claypan soil that also formed in residuum from granitic rock.

Typically, the surface layer is grayish brown and dark grayish brown sandy loam about 16 inches thick. The subsoil is grayish brown and light olive brown mottled clay. At a depth of about 34 inches is weathered granodiorite. In a few places, the surface layer is loam.

Permeability is very slow. Available water capacity is 3.5 to 7.0 inches. The effective rooting depth is 32 to 48 inches. The water table rises to within 10 to 30 inches of the surface during the winter and early in spring. It drops rapidly in May and June, and the soil is dry from July to October. The fine textured subsoil and high water table do not favor the development of an extensive root system. Surface runoff is slow. The hazard of erosion is slight.

This unit is used mainly for native meadow and irrigated pasture.

Erosion can be controlled by tilling across the slope. Cultivation should be limited to establishing pasture. This unit is difficult to work before June because of wetness. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of water tolerant legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Reed canarygrass. The legume seed is inoculated before seeding. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has good potential as habitat for California quail, mourning dove, and pheasant. To encourage wildlife populations, shrub hedgerows can be established

along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This unit is not suited to urban use. The Shenandoah soil is limited by wetness, the very slowly permeable clay subsoil, the shrink-swell potential of the subsoil, and the limited ability to support a load. Both soils are limited by the depth to rock.

Capability unit IVe-3(18) irrigated and nonirrigated; Storie index 51.

114—Auburn silt loam, 2 to 15 percent slopes. This is a shallow, undulating to rolling, well drained soil underlain by vertically tilted metamorphic rock. It formed in residuum on foothills. Elevations are 200 to 1,600 feet. The average annual precipitation ranges from 22 to 35 inches. The average annual air temperature is about 60 degrees F. The average frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 10 percent of the acreage is included areas of Argonaut loam, 5 percent is Sobrante silt loam, and 2 percent is scattered Rock outcrop.

Typically, the surface layer of this Auburn soil is strong brown silt loam about 4 inches thick. The subsoil is yellowish red silt loam. At a depth of 20 inches is basic schist. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 12 to 28 inches. Surface runoff is medium. The erosion hazard is slight to moderate. After intense rainstorms, the soil is saturated and water flows across the surface.

This soil is used mainly for irrigated pasture and rangeland because of shallowness. A few areas are used for deciduous orchards. Some areas are being urbanized.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4 inches of water is applied at each irrigation. The frequency of irrigation is every 5 to 8 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential for rangeland. Forage production can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards.

This soil is used increasingly as sites of subdivisions. The major limitation to urban use is the depth to rock. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because the depth to rock is generally less than 28 inches. Also, this soil is saturated after intense rainstorms.

Capability unit IVe-8(18) irrigated and nonirrigated; Storie index 35.

115—Auburn-Argonaut complex, 2 to 15 percent slopes. These undulating to rolling soils are on broad slopes, in swales, and on concave foot slopes of metamorphic rock foothills. Elevations are 200 to 1,600 feet. The unit is about 45 percent Auburn soil and 35 percent Argonaut soil. The Auburn soil generally occurs on bedrock that is more schistose or fractured, and the Argonaut soil is on bedrock that is more massive. The average annual precipitation ranges from 22 to 35 inches. The average annual air temperature is 60 degrees F. The average frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, and blue and live oak.

About 10 percent of this unit is included areas of Sobrante silt loam, 8 percent is a dark gray poorly

drained clayey soil that is in some swales, and 2 percent is scattered Rock outcrop.

The Auburn soil is shallow and well drained. It formed in residuum from vertically tilted basic schist and slate.

Typically, the surface layer is strong brown silt loam about 4 inches thick. The subsoil is yellowish red silt loam. At a depth of 20 inches is basic schist. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 12 to 28 inches. Surface runoff is medium. The erosion hazard is slight to moderate. After intense rainstorms, the soil is saturated and water flows across the surface.

The Argonaut is a moderately deep, well drained soil that formed in residuum from metabasic rock. The subsoil is dense clay.

Typically, the surface layer is strong brown loam and yellowish red silt loam about 9 inches thick. The upper 7 inches of the subsoil is yellowish red clay loam. The lower part is yellowish brown dense clay. At a depth of 25 inches is weathered basic schist. In places, the surface layer is up to 15 percent gravel, cobbles, or larger stones.

Permeability is slow. The available water capacity is 2.5 to 5 5 inches. The effective rooting depth for most plants is 22 to 34 inches. The clay subsoil restricts some roots, and reduces the water available to plants. Surface runoff is slow to medium. The hazard of erosion is slight or moderate. After intense rainstorms, the soil is saturated and water flows across the surface.

Most of this unit is used for annual rangeland. Some areas are irrigated pasture. A few areas are being urbanized.

These soils should be tilled only to establish irrigated pasture. Tilling should be across the slope to prevent erosion. Rock outcrop makes cultivation difficult. To avoid compaction, the soil should not be worked when wet. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Range legumes respond to applications of sulfur.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4 inches of water is applied at each irrigation. The frequency of irrigation is every 5 to 8 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has good potential for rangeland. Forage can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. The rock outcrop does not appreciably reduce forage production. In a favorable year, the green feed period is from about March 15 to June 1 on the Auburn soil and until June 15 on the Argonaut soil. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This unit is used increasingly as sites of subdivisions. The major limitation to urban use of the Auburn soil is the depth to rock. The major limtations of the Argonaut soil are the depth to rock, the slowly permeable clay subsoil, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the shallow depth to rock and the slowly permeable subsoil. Also, this unit is saturated after intense rainstorms. Septic tank absorption fields should be located away from the rock outcrop. The rock outcrop limits the location of building sites.

Capability subclass VIs(18) irrigated and nonirrigated; Storie index 32.

116—Auburn-Argonaut-Rock outcrop complex, 2 to 15 percent slopes. These undulating to rolling soils are on rocky broad ridges, in swales, and on concave foot slopes of metamorphic rock foothills. Elevations are 200 to 1,600 feet. The unit is about 45 percent Auburn soil, 30 percent Argonaut soil, and 12 percent metamorphic Rock outcrop. The Auburn soil generally occurs on schistose or fractured bedrock, and the Argonaut soil is on massive bedrock. The average annual precipitation is about 22 to 35 inches. The average annual air temperature is about 60 degrees F. The average frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, and blue and live oak.

About 10 percent of this unit is included areas of Sobrante silt loam, and 3 percent a dark gray poorly drained clayey soil in some swales.

The Auburn soil is shallow and well drained. It formed in residuum from vertically tilted metabasic bedrock.

Typically, the surface layer is strong brown silt loam about 4 inches thick. The subsoil is yellowish red silt loam. At a depth of 20 inches is weathered basic schist. In a few places, the surface layer is loam.

Permeabiiity is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 12 to 28 inches. Surface runoff is medium. The erosion hazard is slight to moderate. After intense rainstorms, the soil is saturated and water flows across the surface.

The Argonaut is a moderately deep, well drained soil that formed in the residuum from metabasic rock. The subsoil is dense clay.

Typically, the surface layer is strong brown loam and yellowish red silt loam about 9 inches thick. The upper 7 inches of the subsoil is yellowish red clay loam. The lower part is yellowish brown dense clay. At a depth of 25 inches is weathered metabasic rock. In a few places, the surface layer is up to 15 percent gravel, cobbles, or larger stones.

Permeability is slow. The available water capacity is 2.5 to 5.5 inches. The effective rooting depth for most plants is 22 to 34 inches. The clay subsoil restricts some roots and reduces the available moisture. Surface runoff is slow to medium. The hazard of erosion is slight or moderate. After intense rainstorms, the soil is saturated and water flows across the surface.

Rock outcrop is hard metamorphic rock. It is 1 to 2 feet tall. Some outcrops cover up to 100 square feet.

Surface runoff is very rapid. There is no erosion hazard.

This unit is used mainly for irrigated pasture and rangeland because of the shallowness of the soil. Some areas are being urbanized.

This unit should be tilled only to establish irrigated pasture. Tilling should be across the slope to prevent erosion. Rock outcrop makes cultivation difficult. To avoid compaction, the soil should not be worked when wet. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phophorus. Potassium is usually adequate. Range legumes respond to applications of sulfur.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4 inches of water is applied at each irrigation. The frequency of irrigation is every 5 to 8 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has good potential for rangeland. Forage production can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to June 1 on the Auburn soil and until June 15 on the Argonaut soil. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Pasture areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food.

This unit is used increasingly as sites of subdivisions. The major limitation to urban use of the Auburn soil is the depth to rock. The major limitations of the Argonaut soil are the depth to rock, the slowly permeable clay subsoil, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the shallow depth to rock and the slowly permeable subsoil. Also, this unit is saturated after intense rainstorms.

Capability unit IVe-3(18) irrigated and nonirrigated; Storie index 37.

117—Auburn-Rock outcrop complex, 2 to 30 percent slopes. This undulating to hilly soil and Rock outcrop are on rocky side slopes of metamorphic rock foothills. Elevations are 200 to 1,600 feet. The unit is about 60 percent Auburn soil and 15 percent metamorphic Rock outcrop. The average annual precipitation ranges from 22 to 35 inches. The average annual air temperature is about 60 degrees F. The average frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 10 percent of this unit is included areas of Argonaut loam, generally on the flatter slopes; 10 percent Sobrante silt loam; and 5 percent Boomer loam, mainly on side slopes facing north and east.

The Auburn soil is shallow and well drained. It formed in residuum from vertically tilted metabasic bedrock.

Typically, the surface layer is strong brown silt loam about 4 inches thick. The subsoil is yellowish red silt loam. At a depth of 20 inches is weathered basic schist. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 12 to 28 inches. Surface runoff is medium or rapid. The hazard of erosion is slight to high.

Rock outcrop consists of areas of hard metamorphic rock. Some of the outcrop is 1 to 2 feet high. Some outcrop covers up to 100 square feet.

Surface runoff is very rapid. There is no erosion hazard.

Most of this unit is used for annual rangeland. Selected areas are irrigated pasture. A few areas are urbanized.

This unit should be tilled only to establish irrigated pasture. Tilling should be across the slope to prevent erosion. Rock outcrop makes cultivation difficult. To avoid compaction, the soil should not be worked when wet. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Range legumes respond to applications of sulfur.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4 inches of water is applied at each irrigation. The frequency of irrigation is every 5 to 8 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has good potential for rangeland. Forage production can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. The rock outcrop does not appeciably reduce forage production. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage production.

Open areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This unit is used increasingly as sites of rural subdivisions. The major limitations to urban use are rock outcrop, the depth to rock, and the slope. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the shallowness over rock. They should be located away from the rock outcrop. The rocky areas may dictate the location of building sites.

Capability subclass VIs(18) irrigated and nonirrigated; Storie index 28.

118—Auburn-Sobrante silt loams, 15 to 30 percent slopes. These hilly soils are on metamorphic rock foothills at elevations of 500 to 1,600 feet. The unit is about 50 percent Auburn soil and 40 percent Sobrante soil. The average annual precipitation ranges from 25 to 35 inches. The average annual air temperature is about 60 degrees F. The average annual frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 8 percent of this unit is included areas of Boomer loam, mainly on north- and east-facing slopes, and 2 percent scattered rock outcrop.

The Auburn soil is shallow and well drained. It formed in residuum from vertically tilted metabasic bedrock.

Typically, the surface layer is strong brown silt loam about 4 inches thick. The subsoil is yellowish red silt loam. At a depth of 20 inches is weathered basic schist. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 12 to 28 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

The Sobrante is a moderately deep, well drained soil that formed in residuum from metabasic rock.

Typically, the surface layer is yellowish red silt loam about 7 inches thick. The subsoil is yellowish red silt loam and heavy loam. At a depth of 33 inches is weathered basic schist, and at 40 inches hard basic schist. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 3.0 to 7.0 inches. The effective rooting depth is 22 to 40 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Most of this unit is used for deciduous orchards and irrigated pasture. Some areas are used for annual range. A few areas are being urbanized.

Erosion can be controlled by cultivating across the slope. Cover crops should be used in winter. To avoid compaction, the soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per

hour. A total of 2 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has good potential for rangeland. Forage production can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch, and improved perennial dryland grasses, such as Perlagrass. These grasses should be planted in a well prepared seedbed. In a favorable year, the green feed period is from March 15 to June 1 on the Auburn soil and until June 15 on the Sobrante soil. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards.

This unit is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock and the slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because the depth to rock is generally less than 40 inches.

Capability unit IVe-8(18) irrigated and nonirrigated; Storie index 37.

119—Auburn-Sobrante-Rock outcrop complex, 2 to 30 percent slopes. These undulating to hilly soils are on rock side slopes of metamorphic rock foothills at elevations of 500 to 1,600 feet. The unit is about 45 percent Auburn soil, 30 percent Sobrante soil, and 12 percent metamorphic Rock outcrop. The average annual precipitation ranges from 22 to 35 inches. The average annual air temperature is about 60 degrees F The average frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 8 percent of this unit is included areas of Argonaut loam, generally with slopes of less than 15 percent, and 5 percent Boomer loam, mainly on some side slopes facing north and east.

The Auburn is a shallow, well drained soil that formed in residuum from vertically tilted metabasic bedrock.

Typically, the surface layer is strong brown silt loam about 4 inches thick. The subsoil is yellowish red silt loam. At a depth of 20 inches is basic schist. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 12 to 28 inches. Surface runoff is medium or rapid. The hazard of erosion is slight to high.

The Sobrante is a moderately deep, well drained soil that formed in residuum from metabasic rock.

Typically, the surface layer is yellowish red silt loam about 7 inches thick. The subsoil is yellowish red silt loam and heavy loam. At a depth of 33 inches is weathered basic schist. The soil is 5 to 15 percent gravel and cobble sized rock fragments by volume. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 3.0 to 7.0 inches. The effective rooting depth is 22 to 40 inches. Surface runoff is medium or rapid. The hazard of erosion is slight to high.

Rock outcrop is hard metamorphic rock. Some of the outcrop is 1 to 2 feet high. Some outcrop covers up to 500 square feet.

Surface runoff is very rapid. There is no erosion hazard.

Most areas of this unit are used for annual rangeland. Selected areas are irrigated pasture. A few areas are urbanized.

This unit should be tilled only to establish irrigated pasture. Tilling should be across the slope to prevent erosion. Rock outcrop makes cultivation difficult. To avoid compaction, the soil should not be worked when wet. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Range legumes respond to applications of sulfur.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 5 to 8 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has good potential for rangeland. Forage can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. The rock outcrop does not appreciably reduce forage production. In a favorable year, the green feed period is from about March 15 to June 1 on the Auburn soil and until June 15 on the Sobrante soil. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This unit is used increasingly as sites of rural subdivisions. The major limitations to urban use are rock outcrop, the depth to rock, and the slope. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the depth to rock. They should be located away from the rock outcrop. The rocky areas may dictate the location of building sites.

Capability subclass VIs(18) irrigated and nonirrigated; Storie index 36.

120—Auburn-Sobrante-Rock outcrop complex, 30 to 50 percent slopes. These steep soils are rocky canyon sides of metamorphic rock foothills at elevations of 500 to 1,600 feet. The unit is about 35 percent Auburn soil, 25 percent Sobrante soil, and 15 percent metamorphic Rock outcrop. The average annual precipitation ranges from 25 to 35 inches. The average annual air temperature is about 60 degrees F. The average frost-free season is between 230 and 250 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered brush and pine.

About 10 percent of this unit is included areas of Boomer loam on some north- and east-facing slopes and 15 percent a brown loam soil less than 12 inches deep over hard metamorphic rock.

The Auburn soil is shallow and well drained. It formed in residuum from vertically tilted metabasic bedrock.

Typically, the surface layer is strong brown silt loam about 4 inches thick. The subsoil is yellowish red silt loam. At a depth of 20 inches is basic schist. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 12 to 28 inches. Surface runoff is rapid. The hazard of erosion is high.

The Sobrante is a moderately deep, well drained soil that formed in residuum from metabasic rock.

Typically, the surface layer is yellowish red silt loam about 7 inches thick. The subsoil is yellowish red silt loam and heavy loam. At a depth of 33 inches is weathered basic schist. The soil is 5 to 15 percent gravel and cobble sized rock fragments by volume. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 3.0 to 7.0 inches. The effective rooting depth is 22 to 40 inches. Surface runoff is rapid. The hazard of erosion is high.

Rock outcrop is hard metamorphic rock 2 to 5 feet high. Some of the outcrop covers up to 1 acre.

Surface runoff is very rapid. There is no erosion hazard.

This unit is used for annual rangeland and watershed.

The major limitation to rangeland is the slope. Uniform grazing is difficult to achieve because livestock tend to trail around the slope. In a favorable year, the green feed period is from about March 15 to June 1 on the Auburn soil and until June 15 on the Sobrante soil. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey.

The steepness of slope and the rock outcrop are the major limitations to be considered in planning home and road construction. Soil slumps on the Sobrante soil can be a hazard to road cuts because of the low strength and the lateral movement of water in winter.

Capability subclass VIs(18) nonirrigated; Storie Index 17.

121—Auburn-Sobrante-Rock outcrop complex, 50 to 70 percent slopes. These very steep soils are on rocky canyons of major drainageways in the metamorphic rock foothills. Elevations are 500 to 1,600 feet. The unit is about 30 percent Auburn soil, 25 percent Sobrante soils, and 20 percent metamorphic Rock outcrop. The average annual precipitation ranges from 25 to 36 inches. The average annual air temperature is about 60 degrees F. The average frost-free season is between 230 and 250 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered brush and pine.

About 10 percent of this unit is included areas of Boomer loam on some north- and east-facing slopes and 15 percent a brown loam soil less than 12 inches deep over hard metamorphic rock.

The Auburn soil is shallow and well drained. It formed in residuum from vertically tilted metabasic bedrock.

Typically, the surface layer is strong brown silt loam about 4 inches thick. The subsoil is yellowish red silt loam. At a depth of 20 inches is basic schist. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 12 to 28 inches. Surface runoff is rapid. The hazard of erosion is very high.

The Sobrante is a moderately deep well drained soil that formed in residuum from metabasic rock.

Typically, the surface layer is yellowish red silt loam about 7 inches thick. The subsoil is yellowish red silt loam and heavy loam. At a depth of 33 inches is weathered basic schist. The soil is 10 to 15 percent gravel and cobbly sized rock fragments by volume. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 3.0 to 7.0 inches. The effective rooting depth is 22 to 40 inches. Surface runoff is rapid. The hazard of erosion is very high.

Rock outcrop is hard metamorphic rock 2 to 5 feet high. Some of the outcrop covers up to 1 acre.

Surface runoff is very rapid. There is no erosion hazard.

This unit is used mainly for watershed. It has limited grazing value. Brushy areas provide cover for wildlife.

Capability subclass VIIIs(18) nonirrigated; Storie index 10.

122—Boomer loam, 2 to 15 percent slopes. This is a deep, undulating to rolling, well drained soil underlain by weathered metabasic bedrock. It formed in residuum on ridges and foot slopes. Elevations are 1,000 to 2,000 feet. The average annual precipitation ranges from 30 to 45 inches. The average annual air temperature is about 58 degrees F. The average frost-free season is between 170 and 250 days. Natural vegetation is conifer-hardwood forest and some annual and perennial grasses.

At the lower elevations, about 10 percent of the acreage is included areas of Sobrante silt loam and 5 percent Auburn silt loam. At the higher elevations, 10 percent is Sites loam and 5 percent is Josephine loam. Also included are small areas of a soil that is similar to this Boomer soil but is 30 to 40 inches deep to weathered bedrock. Scattered rock outcrop makes up about 2 percent of the acreage.

Typically, the surface layer of this Boomer soil is brown and yellowish red loam about 10 inches thick. The subsoil is reddish yellow clay loam and gravelly clay loam. At a depth of 58 inches is weathered basic schist.

Permeability is moderately slow. The available water capacity is 5.0 to 9.0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is medium. The hazard of erosion is slight or moderate.

Most areas are used for wood crops. Some areas where water is available for irrigation are used for irrigated pasture or for apple and pear orchards. Selected varieties of grapes are also grown. A few areas are being subdivided for homesites.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. To avoid compaction, cultivation should be limited to the control of weeds. This soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. This cover should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil is well suited to ponderosa pine production. It is suited to intensive management and is capable of producing about 111 cubic feet, or 617 board feet (International rule), per acre annually of merchantable timber from a fully stocky, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards and vineyards.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Community sewage systems may be needed in moderate to high density subdivisions. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability.

Capability unit IIIe-1(22) irrigated and nonirrigated; Storie index 65.

123—Boomer loam, 15 to 30 percent slopes. This is a deep, hilly, well drained soil underlain by weathered metabasic bedrock. It formed in residuum on uplands at elevations of 1,000 to 2,000 feet. At the lower elevations this soil is generally on north- and east-facing slopes. At higher elevations it is on south- and west-facing slopes. The average annual precipitation ranges from 30 to 45 inches. The average annual air temperature is about 58 degrees F. The average frost-free season ranges from 170 to 250 days. Natural vegetation is conifer-hardwood forest and some annual and perennial grasses.

At the lower elevations, about 10 percent of the acreage is included areas of Sobrante silt loam and 5 percent Auburn silt loam. At the higher elevations, 5 percent is Sites loam and 10 percent is Josephine loam. Also included are small areas of a soil that is similar to this Boomer soil but is 30 to 40 inches deep to weathered bedrock. Scattered rock outcrop makes up about 2 percent of the acreage.

Typically, the surface layer of this Boomer soil is brown and yellowish red loam about 10 inches thick. The subsoil is reddish yellow clay loam and gravelly clay loam. At a depth of 58 inches is weathered basic schist.

Permeability is moderately slow. The available water capacity is 5.0 to 9.0 inches. The effective rooting depth is 40 to 60 inches. The surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Most areas are used for wood crops. Some are used for irrigated pasture and family orchards. A few are being subdivided for homesites.

Erosion can be controlled by using permanent cover. Cultivation to establish permanent cover should be across the slope. To avoid compaction, the soil should not be worked when wet. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping. It responds to applications of nitrogen and phosphorus Potassium is usually adequate.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil is well suited to ponderosa pine production. It is suited to intensive management and is capable of producing about 111 cubic feet, or 617 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil Pruning is needed to reduce excessive growth between whorls.

Pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards and vineyards.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability of the soil to support a load. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope and the moderately slow permeability. Community sewage systems may be needed in moderate to high density subdivisions.

Capability unit IVe-1(22) irrigated and nonirrigated; Storie index 54.

124—Boomer-Rock outcrop complex, 5 to 30 percent slopes. This gently rolling to hilly soil and Rock outcrop are on mountainous uplands at elevations of 1,000 to 2,000 feet. The unit is about 60 percent Boomer soil and 10 percent metamorphic Rock outcrop. The average annual precipitation ranges from 30 to 45 inches. The average annual air temperature is about 58 degrees F. The average frost-free season ranges from 170 to 250 days. Natural vegetation is conifer-hardwood forest and some annual and perennial grasses.

About 10 percent of this unit is included areas of Josephine loam, 10 percent Sobrante silt loam, 5 percent Auburn silt loam, and 5 percent Sites loam. Also included are small areas of a soil that is similar to this Boomer soil but is 30 to 40 inches deep to weathered bedrock.

The Boomer soil is well drained and is deep over weathered metabasic rock. It formed in residuum from amphibolite schist or meta-andesite.

Typically, the surface layer is brown and yellowish red loam about 10 inches thick. The subsoil is reddish yellow clay loam and gravelly clay loam. At a depth of 58 inches is weathered basic schist.

Permeability is moderately slow. The available water capacity is 5.0 to 9.0 inches. The effective rooting depth is 40 to 60 inches. The surface runoff is medium or rapid. The hazard of erosion is slight to high.

Rock outcrop consists of areas of scattered hard metamorphic rock 1 to 2 feet high Some of the outcrop covers up to 100 square feet.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is used mainly for wood crops. A few areas are being subdivided for homesites.

This unit is well suited to ponderosa pine production. It is suited to intensive management and is capable of producing about 111 cubic feet, or 617 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Rock outcrop does not appreciably reduce wood crops. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this unit. Pruning is needed to reduce excessive growth between whorls.

Open areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This unit is used increasingly as sites for rural subdivisions. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, the slope, rock outcrop, and the limited ability to support a load. Dwelling and road construction can be designed to offset the rock outcrop, the shrink-swell potential, and the limited ability of the soil to support a load. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope and the moderately slow permeability. They should be located away from the rock outcrop. Community sewage systems may be needed in moderate to high density subdivisions.

Capability subclass VIs(22) nonirrigated; Storie index 46.

125—Boomer-Rock outcrop complex, 30 to 50 percent slopes. This steep soil and Rock outcrop are on rocky side slopes of mountainous uplands at elevations of 1,000 to 2,000 feet. The unit is about 60 percent Boomer soil and 10 percent metamorphic rock outcrop. The average annual precipitation ranges from 30 to 45 inches. The average annual air temperature is about 58 degrees F. The average frost-free season is between 170 and 250 days. Natural vegetation is conifer-hardwood forest and some annual and perennial grasses.

About 10 percent of this unit is included areas of Auburn silt loam, 10 percent Josephine loam, and 10 percent Sobrante silt loam. Also included are small areas of a soil that is similar to this Boomer soil but is 30 to 40 inches deep to weathered bedrock.

The Boomer soil is well drained and is deep over weathered metabasic rock. It formed in the residuum from amphibolite schist or meta-andesite.

Typically, the surface layer is brown and yellowish red gravelly loam about 10 inches thick. The subsoil is reddish yellow gravelly clay loam. At a depth of 58 inches is weathered basic schist.

Permeability is moderately slow. The available water capacity is 4.5 to 9.0 inches. The effective rooting depth is 40 to 60 inches. The surface runoff is rapid. The hazard of erosion is high.

Rock outcrop consists of areas of scattered hard metamorphic rock, generally ranging in height from 2 to 5 feet. Some of the outcrop covers up to 500 square feet.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is used for wood crops. It is well suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 111 cubic feet, or 617 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope Rock outcrop does not appreciably affect the use of this unit. Conventional methods used in tree harvest can be used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the high erosion hazard. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants. Christmas trees can be grown on this unit. Pruning is needed to reduce excessive growth between whorls.

This unit provides good habitat for black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

The steepness of slope and rock outcrop are the major limitations to be considered in planning home and road construction. Soil slumps can be a hazard to road cuts because of the low strength and the lateral movement of water in winter.

Capability subclass VIs(22) nonirrigated; Storie index 22.

126—Boomer-Rock outcrop complex, 50 to 70 percent slopes. This very steep soil and Rock outcrop are on rocky canyons of the mountainous uplands. Elevations are 1,000 to 2,000 feet. The unit is about 55 percent Boomer soil and 15 percent metamorphic Rock outcrop. The average annual precipitation ranges from 30 to 45 inches. The average annual air temperature is about 58 degrees F. The average frost-free season is

between 150 and 240 days. Natural vegetation is conifer-hardwood forest and some annual and perennial grasses.

About 15 percent of this unit is included areas of Sobrante silt loam, 10 percent is Auburn silt loam, and 5 percent is Josephine loam. Also included are small areas of a soil that is similar to this Boomer soil but is 30 to 40 inches deep to weathered bedrock.

The Boomer soil is well drained and is deep over weathered metabasic rock. It formed in residuum from amphibolite schist or meta-andesite.

Typically, the surface layer is brown and yellowish red gravelly loam about 10 inches thick. The subsoil is reddish yellow gravelly clay loam. At a depth of 56 inches is weathered basic schist.

Permeability is moderately slow. The available water capacity is 4.5 to 9.0 inches. The effective rooting depth is 40 to 60 inches. The surface runoff is rapid. The hazard of erosion is very high.

Rock outcrop consists of areas of scattered hard metamorphic rock, generally ranging in height from 2 to 5 feet. Some of the outcrop covers up to 1 acre.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is used for wood crops and watershed. It is suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 111 cubic feet, or 617 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope. Rock outcrop does not appreciably affect the use of this unit. The slope makes it difficult to use conventional methods in tree harvest and can result in soil damage because of the very high erosion hazard. Road and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants.

This unit provides habitat for black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

Capability subclass VIIs(22) nonirrigated; Storie index 15.

127—Boomer Variant stony sandy loam, 2 to 15 percent slopes. This is an undulating to rolling, deep, well drained stony soil underlain by weathered syenite. It formed in residuum on side slopes of Sugar Pine Mountain. Elevations are 1,600 to 2,200 feet. The average annual precipitation ranges from 35 to 45 inches. The average annual air temperature is about 58 degrees F. The average frost-free season ranges from 200 to 240 days. Natural vegetation is conifer-hardwood forest and scattered brush.

About 30 percent of the acreage is included areas of a deep sandy loam that is along the southern edge of this Boomer variant and has an abrupt red clay subsoil. Another 10 percent is a soil that is similar to this Boomer variant but is 20 to 40 inches deep to weathered bedrock. In most swale positions is a poorly drained claypan soil that is identified by spot symbols on the soil map.

Typically, the surface layer of the Boomer variant is brown and light brown very stony sandy loam and loam about 11 inches thick. The upper 25 inches of the subsoil is reddish yellow heavy loam and clay loam. The lower part is reddish yellow clay. At a depth of 60 inches is weathered nepheline syenite.

Permeability is slow. The available water capacity is 7.0 to 9.5 inches. The effective rooting depth is 50 to 72 inches. Below 20 to 36 inches the dense clay may restrict tree roots. Surface runoff is medium. The hazard of erosion is slight or moderate.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and family orchards. A few areas are being subdivided for homesites.

Erosion can be controlled by tilling across the slope and by using cover crops in orchards in winter. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Stones cause some difficulty in tilling. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil is suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 77 cubic feet, or 363 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Con-

ventional methods can be used in harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the slow permeability of the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the slow permeability. Community sewage systems are needed in moderate to high density subdivisions.

Capability unit IVe-3(22) irrigated and nonirrigated; Storie index 41.

128—Boomer Variant very stony sandy loam, 15 to 50 percent slopes. This is a hilly to steep, deep, well drained very stony soil underlain by weathered syenites. It formed in residuum on side slopes of Sugar Pine Mountain. Elevations are 1,600 to 2,200 feet. The average annual precipitation ranges from 35 to 45 inches. The average annual air temperature is about 58 degrees F. The average frost-free season is between 200 to 240 days. Natural vegetation is conifer-hardwood forest and scattered brush.

About 10 percent of the acreage is included areas of a deep sandy loam that is along the southern edge of this Boomer variant and has an abrupt red clay subsoil. Another 10 percent is a soil that is similar to this Boomer variant but is 20 to 40 inches deep to weathered bedrock. In some swale positions is a poorly drained claypan soil that is identified by spot symbols on the soil map. About 250 acres on the south slope of Sugar Pine Mountain are extremely stony. These areas also are identified by spot symbols on the soil map.

Typically, the surface layer of the Boomer variant is brown and light brown very stony sandy loam and loam about 11 inches thick The upper 25 inches of the subsoil is reddish yellow heavy loam and clay loam. The lower part is reddish yellow clay. At a depth of 60 inches is weathered nepheline syenite.

Permeability is slow. The available water capacity is 6.5 to 9.5 inches The effective rooting depth is 50 to 60 inches. Below 20 to 36 inches the dense clay may restrict tree roots. Surface runoff is medium or rapid. The hazard of erosion is high.

This soil is used mainly for wood crops. It is suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 64 cubic feet, or 256 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slowly permeable clay subsoil, which restricts the downward movement of tree roots. Stones cause some problems in road construction and the movement of equipment. Conventional methods can be used in tree harvest on slopes less than 30 percent but their use may be restricted in winter. On slopes greater than 30 percent, conventional methods can be used only with difficulty, and the soil can be damaged because of the high erosion hazard. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 8 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants. Christmas trees can be grown on this soil.

Open areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the slow permeability of the subsoil, the shrink-swell potential of the subsoil, the slope, stones, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset the shrink-swell potential and the limited ability to support a load. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Soil slumps can be a hazard to road cuts because of the low strength and the lateral movement of water in winter. Septic tank absorption fields may not function properly because of the slope and the slow permeability. Community sewage systems are needed in moderate to high density subdivisions.

Capability subclass VIs(22) nonirrigated; Storie index 19.

129—Caperton gravelly coarse sandy loam, 2 to 30 percent slopes. This is an undulating to hilly, shallow, somewhat excessively drained soil underlain by granitic rock. It formed in residuum on side slopes in the Folsom Lake-Loomis Basin area. Elevations are 200 to 1,000 feet. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered brush.

About 10 percent of the acreage is included areas of Andregg coarse sandy loam, and 5 percent is a soil that is similar to Sierra sandy loam but is 20 to 40 inches deep to weathered rock. Shenandoah sandy loam occurs in some swales. Also in swales and along drainageways is a somewhat poorly drained or moderately well drained soil that is otherwise similar to this Caperton soil. Also included is a small area of a soil, in the southern part of the survey area, paralleling Douglas, Eureka, and Olive Branch Roads, that has a thin remnant of a gravel mantle left from old valley fill.

Typically, the surface layer of this Caperton soil is mixed dark grayish brown, grayish brown, and brown gravelly coarse sandy loam about 12 inches thick. The next 6 inches is pale brown gravelly coarse sandy loam. At a depth of 18 inches is weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 0.5 to 2 inches. The effective rooting depth is 8 to 20 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

This soil is used mainly for annual range and irrigated pasture. It supports a few old orchards and vineyards. Many areas are being converted to rural or ranchette housing.

This soil should be tilled only to establish irrigated pasture. Tilling should be across the slope. Slopes greater than 15 percent are difficult to cultivate. To avoid compaction, this soil should not be worked when wet. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Range legumes respond to applications of sulfur.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 1 to 2 inches of water is applied at each irrigation. The frequency of irrigation is every 4 to 6 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has fair potential for rangeland. Forage production can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to May 15. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock and the slope. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Because of the erodibility of this soil and its parent material, all cuts and fills should be on at least a 2 to 1 slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the depth to rock. Even on a large acreage, septic tank absorption fields may not function properly because the depth to rock is less than 20 inches.

Capability subclass VIe(18) irrigated and nonirrigated; Storie index 24.

130—Caperton-Andregg coarse sandy loams, 2 to 15 percent slopes. These undulating to rolling soils are on the granitic foothills in the Folsom Lake-Loomis Basin area at elevations of 200 to 1,000 feet. The unit is about 50 percent Caperton soil and 30 percent Andregg soil. The Caperton soil is on rounded knolls, and the Andregg soil is on foot slopes. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 3 percent of this unit is included areas of Sierra sandy loam, 5 percent is a soil that is similar to the Sierra soil but is 20 to 40 inches deep to weathered rock, and 10 percent is soils in swales and along drainageways that are similar to the Caperton and Andregg soils but are moderately well drained to poorly drained. Also included in some swales are small areas of Shenandoah sandy loam. About 2 percent of this unit is scattered granitic rock outcrop.

The Caperton is a shallow, somewhat excessively drained soil that formed in residuum from granitic rock.

Typically, the surface layer is grayish brown and brown coarse sandy loam about 12 inches thick. The next 6 inches is pale brown gravelly coarse sandy loam. At a depth of 18 inches is weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 1.0 to 2.5 inches. The effective rooting depth is 8 to 20 inches. Surface runoff is medium. The hazard of erosion is moderate.

The Andregg is a moderately deep, well drained soil that also formed in residuum from granitic rock.

Typically, the surface layer is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is medium. The hazard of erosion is moderate.

Most areas are used for irrigated pasture and deciduous orchards. A few areas are used for rangeland. Many areas are being converted to rural or ranchette housing.

Erosion can be controlled by cultivating across the slope. Cover crops should be used in winter. To avoid compaction, these soils should not be cultivated or have equipment moved across them when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards. Orchards appear patchy because trees are more vigorous and productive on the Andregg part of the unit.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 3 inches of water is applied at each irrigation. The frequency of irrigation is every 5 to 8 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has good potential for annual rangeland. Forage production can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to May 15 on the Caperton soil and from about March 15 to June 15 on the Andregg soil. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards.

This unit is used increasingly as sites of rural subdivisions. The major limitations to urban use is the depth to rock. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because the depth to rock generally ranges from 8 to 40 inches.

Capability unit IVe-4(18) irrigated and nonirrigated; Storie index 37.

131—Caperton-Andregg coarse sandy loams, 15 to 30 percent slopes. These hilly soils are on granitic foothills in the Folsom Lake-Loomis Basin area at elevations of 200 to 1,000 feet. The unit is about 60 percent Caperton soil and 35 percent Andregg soil. The Caperton soil is on rounded knolls. The Andregg soil is on foot slopes. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 2 percent of this unit is included areas of Sierra sandy loam and 3 percent is a soil that is similar to the Sierra soil but is 20 to 40 inches deep to weathered rock. Also included are small, scattered areas of granitic rock outcrop.

The Caperton is a shallow, somewhat excessively drained soil that formed in residuum from granitic rock.

Typically, the surface layer is grayish brown and brown coarse sandy loam about 12 inches thick. The next 6 inches is pale brown gravelly coarse sandy loam. At a depth of 18 inches is weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 1.0 to 2.5 inches. The effective rooting depth is 8 to 20 inches. Surface runoff is medium or rapid. The hazard or erosion is high.

The Andregg is a moderately deep, well drained soil that also formed in residuum from granitic rock.

Typically, the surface layer is grayish brown coarse sandy loam about 15 inches thick. The subsoil is pale brown and very pale brown coarse sandy loam. At a depth of 29 inches is highly weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 2.5 to 5.0 inches. The effective rooting depth is 24 to 40 inches. Surface runoff is medium to rapid. The hazard of erosion is high.

Most areas are used for irrigated pasture, deciduous orchards, and rangeland. Many areas are being converted to rural or ranchette housing.

Erosion can be controlled by using permanent cover. The planting of orchards and all cultivation should be across the slope. These soils should be tilled only to

establish improved permanent cover. To avoid compaction, they should not be worked when wet. Sprinklers should be used in irrigating.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards. Orchards appear patchy because trees are more vigorous and productive on the Andregg part of the unit.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 3 inches of water is applied at each irrigation. The frequency of irrigation is every 5 to 8 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has good potential for rangeland. Forage production can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to May 15 on the Caperton soil and from about March 15 to June 1 on the Andregg soil. Grazing should be controlled so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soils from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thicket can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Grain provides food. Deer present serious depredation problems in orchards.

This soil is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock and the slope. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Because of the erodibility of these soils and their parent materials, all cuts and fills should be on at least a 2 to 1 slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the depth to rock. On a large acreage, the absorption field should be located on the Andregg soil. Even then there will be some problems because of the slope and the depth to rock.

Capability subclass VIe(18) irrigated and nonirrigated; Storie index 31.

132—Caperton-Rock outcrop complex, 2 to 30 percent slopes. This undulating to hilly soil and Rock outcrop are on granitic uplands in the Folsom Lake-Loomis Basin area at elevations of 200 to 1,000 feet. The unit is about 65 percent Caperton soil and 15 percent granitic Rock outcrop. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered brush.

About 10 percent of this unit is included areas of Andregg coarse sandy loam, 5 percent is a soil that is similar to Sierra sandy loam but is 20 to 40 inches deep to weathered rock, and 5 percent is a moderately well drained or poorly drained soil in swales and along drainageways that otherwise is similar to Caperton gravelly coarse sandy loam. On some granitic side slopes of the volcanic ridges, the surface layer of this Caperton soil is 5 to 20 percent andesitic cobbles.

The Caperton is a shallow, somewhat excessively drained soil that formed in residuum from granitic rock.

Typically, the surface layer is grayish brown and brown gravelly coarse sandy loam about 12 inches thick. The next 6 inches is pale brown gravelly coarse sandy loam. At a depth of 18 inches is weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 0.5 to 2.0 inches. The effective rooting depth is 8 to 20 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Rock outcrop is hard granitic rock. It ranges from 2 to 5 feet in diameter to areas that cover up to one-half acre.

Surface runoff is very rapid. There is no hazard of erosion.

Most of this unit is used for rangeland. Some areas are being converted to rural or ranchette housing. Selected areas are used for irrigation.

This unit should be tilled only to establish irrigated pasture. Tilling should be across the slope to prevent erosion. The rock outcrop makes cultivation difficult. To avoid compaction, this Caperton soil should not be worked when wet. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Range legumes respond to applications of sulfur.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 1 to 2 inches of water is applied at each irrigation. The frequency of irrigation is every 4 to 6 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has fair potential for rangeland. Forage production can be increased by the introduction of improved annuals, such as Blando bromegrass and Lana vetch. The rock outcrop does not appreciably reduce forage production. In a favorable year, the green feed period is from about March 15 to May 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. The Caperton soil should be grazed only when dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This unit is used increasingly as sites of rural subdivisions. The major limitations to urban use are the depth to rock, the rock outcrop, and the slope. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Because of the erodibility of the Caperton soil and its parent material, all cuts and fills should be on at least a 2 to 1 slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the shallow depth to rock. Even on a large acreage, the absorption field may not function properly because the depth to rock is less than 20 inches and the soil is saturated after intense rainstorms. The absorption fields should be located away from the rock outcrop. The rock outcrop also limits the location of building sites.

Capability subclass VIIs(18) irrigated and nonirrigated; Storie index 20.

133—Caperton-Rock outcrop complex, 30 to 50 percent slopes. This steep soil and Rock outcrop are on granitic side slopes of volcanic ridges in the Loomis Basin. Elevations are 300 to 1,000 feet. The unit is about 70 percent Caperton soil and 15 percent granitic Rock outcrop. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered brush.

About 15 percent of this unit is included areas of Andregg coarse sandy loam. On the upper slopes, below the volcanic ridges, the surface layer of this Caperton soil is 5 to 20 percent andesitic cobbles.

The Caperton is a somewhat excessively drained, shallow soil that formed in residuum from granitic rock.

Typically, the surface layer is grayish brown and brown gravelly coarse sandy loam about 12 inches thick. The next 6 inches is pale brown gravelly coarse sandy loam. At a depth of 18 inches is weathered granodiorite.

Permeability is moderately rapid. The available water capacity is 0.5 to 2.0 inches. The effective rooting depth is 6 to 20 inches. Surface runoff is rapid. The hazard of erosion is high.

Rock outcrop consists of areas of scattered hard granitic rock ranging from 2 to 5 feet in diameter to areas that cover up to one-half acre.

Surface runoff is very rapid. There is no hazard of erosion.

Most areas are used for rangeland and watershed.

The major limitation to rangeland is the slope. Uniform grazing is difficult to achieve because livestock tend to trail around the slope. In a favorable year, the green feed period is from March 15 to May 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey.

The steepness of slope, the erosion hazard, and the rock outcrop are the major limitations to be considered in planning home and road construction.

Capability subclass VIIs(18) nonirrigated; Storie index 10.

134—Cohasset loam, 2 to 9 percent slopes. This is a deep, well drained soil underlain by weathered andesitic conglomerate. It formed in residuum on long, broad volcanic ridges at elevations of 2,000 to 4,600 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 57 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest.

About 5 percent of the acreage is included areas of Aiken loam and 5 percent McCarthy cobbly sandy loam.

Typically, the surface layer of this Cohasset soil is dark brown and reddish brown loam about 18 inches thick. The subsoil is yellowish red and strong brown heavy loam and clay loam. At a depth of 57 inches is weathered andesitic conglomerate. The surface layer is 2 to 10 percent gravel and cobbles by volume. The

subsoil is 10 to 20 percent gravel and cobbles. In a few places, the surface layer is sandy loam.

Permeability is moderate. The available water capacity is 5.0 to 10.0 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium. The hazard of erosion is slight.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, the fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Cohasset soil is one of the best soils in the area for ponderosa pine production. It is suited to very intensive management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Cohasset soil. The major limitations to urban use are the depth to rock, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the depth to rock.

Capability units IIe-1(22) irrigated, IIIe-1(22) nonirrigated; Storie index 73.

135—Cohasset loam, 9 to 15 percent slopes. This is a deep, sloping, well drained soil underlain by weathered andesitic conglomerate. It formed in residuum on volcanic ridges at elevations of 2,000 to 4,600 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest.

About 5 percent of the acreage is included areas of Aiken loam, and 8 percent is McCarthy cobbly sandy loam.

Typically, the surface layer of this Cohasset soil is dark brown and reddish brown loam about 18 inches thick. The subsoil is yellowish red and strong brown heavy loam and clay loam. At a depth of 57 inches is weathered andesitic conglomerate. In a few places, the surface layer is sandy loam.

Permeability is moderate. The available water capacity is 5.0 to 10.0 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium. The hazard of erosion is moderate.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass and Blando bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A peren-

nial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need minor applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apples and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Cohasset soil is one of the best soils in the area for ponderosa pine production. It is suited to very intensive management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Cohasset soil. The major limitations to urban use are the depth to rock, the slope, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the slope and the depth to rock.

Capability unit IIIe-1(22) irrigated and nonirrigated; Storie index 65.

136—Cohasset loam, 15 to 30 percent slopes. This is a deep, moderately steep, well drained soil underlain by weathered andesitic conglomerate. It formed in residuum on side slopes of volcanic ridges at elevations of 2,000 to 4,600 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 240 days. Natural vegetation is conifer-hardwood forest.

About 3 percent of the acreage is included areas of Aiken loam, 10 percent is McCarthy cobbly sandy loam, and 5 percent is Cohasset cobbly loam.

Typically, the surface layer of this Cohasset soil is dark brown and reddish brown loam about 18 inches thick. The subsoil is yellowish red and strong brown heavy loam and clay loam. At a depth of 57 inches is weathered andesitic conglomerate. In a few places, the surface layer is sandy loam.

Permeability is moderate. The available water capcity is 5.0 to 10.0 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by using permanent cover in the orchards. Cultivation to establish permanent cover should be across the slope. Orchards should be planted and worked across the slope. To avoid compaction, this soil should not be worked when wet. The slope makes cultivation difficult. Sprinklers should be used in irrigating.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is

every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Cohasset soil is one of the best soils in the area for ponderosa pine production. It is suited to very intensive management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 12 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Cohasset soil. The major limitations to urban use are the slope, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset the shrink-swell potential and the limited ability to support a load. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope.

Capability unit IVe-1(22) irrigated and nonirrigated; Storie index 57.

137—Cohasset cobbly loam, 5 to 15 percent slopes. This is a deep, well drained cobbly soil underlain by weathered andesitic conglomerate. It formed in residuum on long, broad volcanic ridges and their side slopes at elevations of 2,000 to 4,600 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest.

About 5 percent of the acreage is included areas of Aiken loam, 5 percent McCarthy cobbly sandy loam, and 10 percent a soil that is similar to this Cohasset soil but is 24 to 40 inches deep to weathered rock.

Typically, the surface layer of this Cohasset soil is dark brown and reddish brown cobbly loam about 18 inches thick. The subsoil is reddish brown cobbly heavy loam and yellowish red and strong brown cobbly clay loam. At a depth of 57 inches is weathered andesitic conglomerate. In a few places, the surface layer is sandy loam.

Permeability is moderate. The available water capacity is 4.5 to 9.5 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium. The hazard of erosion is moderate.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. Cobbles make cultivation somewhat difficult. To avoid compaction, the soil should not be cultivated or have equipment moved across it when wet. Sprinkers should be used in irrigating.

Wimmera 62 ryegrass and Blando bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. This cover should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture should consist of a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each application. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Cohasset soil is one of the best soils in the area for ponderosa pine production. It is suited to very intensive management. The cobbles do not restrict tree growth. This soil is capable of producing about 125 cubic feet, or 700 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in

winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and stream-banks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Cohasset soil. The major limitations to urban use are the depth to rock, the slope, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the slope and the depth to rock.

Capability unit IIIe-7(22) irrigated and nonirrigated; Storie index 51.

138—Cohasset cobbly loam, 15 to 30 percent slopes. This is a deep, moderately steep, well drained cobbly soil underlain by weathered andesite conglomerate. It formed in residuum on side slopes of volcanic ridges at elevations of 2,000 to 4,600 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 240 days. Natural vegetation is conifer-hardwood forest.

About 10 percent of the acreage is included areas of McCarthy cobbly sandy loam, 5 percent is Iron Mountain cobbly sandy loam, and 10 percent is a soil that is similar to this Cohasset soil but is 24 to 40 inches deep to weathered bedrock.

Typically, the surface layer of this Cohasset soil is dark brown and reddish brown cobbly loam about 18 inches thick. The subsoil is reddish brown cobbly heavy loam and yellowish red and strong brown cobbly clay loam. At a depth of 57 inches is weathered andesitic conglomerate. In a few places, the surface layer is sandy loam.

Permeability is moderate. The available water capacity is 4.5 to 9.5 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by using permanent cover in the orchards. Cultivation to establish permanent cover should be across the slope. Orchards should be planted and worked across the slope. To avoid compaction, the soil should not be worked when wet. Cobbles and the slope make cultivation difficult. Sprinklers should be used in irrigating.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Cohasset soil is one of the better soils in the area for ponderosa pine production. It is suited to very intensive management. It is capable of producing about 125 cubic feet, or 700 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 12 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and stream-banks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Cohasset soil. The major limiations to

urban use are the slope, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset the shrink-swell potential and the limited ability to support a load. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope.

Capability unit IVe-7(22) irrigated and nonirrigated; Storie index 42.

139—Cohasset cobbly loam, 30 to 50 percent slopes. This is a deep, steep, well drained cobbly soil underlain by weathered andesitic conglomerate. It formed in residuum on side slopes of volcanic ridges at elevations of 2,000 to 4,600 feet. The average annual preciptiation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 150 and 200 days. Natural vegetation is conifer-hardwood forest.

About 15 percent of the acreage is included areas of McCarthy cobbly sandy loam and 10 percent is a soil that is similar to this Cohasset soil but is 24 to 40 inches deep to weathered rock.

Typically, the surface layer of this Cohasset soil is dark brown and reddish brown cobbly loam about 18 inches thick. The subsoil is reddish brown cobbly heavy loam and yellowish red and strong brown cobbly clay loam. At a depth of 57 inches is weathered andesitic conglomerate. In a few places, the surface layer is sandy loam.

Permeability is moderate. The available water capacity is 4.5 to 9.5 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is rapid. The hazard of erosion is high.

This soil is used mainly for wood crops.

This Cohasset soil is well suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 125 cubic feet, or 700 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope. The cobbles do not appreciably affect the use of this soil. Conventional methods used in tree harvest can be used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the high erosion hazard. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 12 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants. Christmas trees can be grown on this soil. Pruning is needed to reduce the excessive growth between whorls.

Forested areas provide good habitat for black bear, black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

The steepness of slope is the major limitation to be considered in planning home and road construction. Soil slumps can be a hazard to road cuts because of the low strength and the lateral movement of water in winter.

Capability subclass VIe(22) nonirrigated; Storie index 24.

140—Cometa sandy loam, 1 to 5 percent slopes. This is a deep, well drained claypan soil on low terraces at elevations of 75 to 200 feet. It formed in alluvium, mainly from granitic sources. It occurs mainly northwest of Roseville. The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses, forbs, and scattered oak.

About 10 percent of the acreage is included areas of Fiddyment loam, 5 percent is Kaseberg loam, and 5 percent is San Joaquin sandy loam. The scattered narrow ridges are Ramona sandy loam. Alamo clay is in some drainageways and basins. Also included are a few small areas where slopes range to 9 percent.

Typically, the surface layer of this Cometa soil is brown sandy loam about 18 inches thick. The subsoil is brown clay. At a depth of about 29 inches is compacted very brown sandy loam.

Permeability is very slow. The available water capacity is 4.0 to 6.0 inches. The effective rooting depth is 60 inches or more, but roots are restricted to cracks and faces of peds below a depth of 18 inches because of the dense clay subsoil. Surface runoff is slow. The hazard of erosion is slight. After intense rainstorms, the soil is saturated for a short time.

Most areas are used for dryland winter grains and irrigated pasture. A few areas are in rice.

When grain is grown, this soil is usually fallowed in alternate years to conserve moisture and control weeds. The low yields can be improved by applications of nitrogen, especially when it is applied in both nitrate and ammonia form. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet, except in growing rice. Suitable irrigation methods are flood, border, or sprinkler.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping. It responds to applications of nitrogen and phosphorus. Leveling for border irrigation may expose the dense clay subsoil. The frequency of irrigation is about every 5 to 8 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

Flatter areas are well suited to rice. The soil needs to be leveled so that water can be ponded on it. The clay subsoil and the compacted substratum are nearly impervious to the downward movement of water. Water requirements for rice are about 1 cubic foot per second for 40 acres after the checks are flooded. Rice should be rotated with barley every 2 to 4 years to help control aquatic weeds and soil fungus.

Grainfields have limited potential as habitat for mourning dove. Irrigated pasture and ricefields provide habitat for dove and pheasant. Ricefields provide good habitat for duck. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This soil supports little construction except for farmsteads The major limitations to construction are the very slow permeability of the subsoil, the shrink-swell potential of the soil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the very slow permeability in the subsoil and the substratum.

Capability unit IIIe-3(17) irrigated and nonirrigated; Storie index 39

141—Cometa-Fiddyment complex, 1 to 5 percent slopes. These undulating soils are on low terraces generally west of State Route 65 and south of Auburn Ravine. They occur at elevations of 75 to 200 feet The unit is about 35 percent Cometa soil and 35 percent Fiddyment soil. The Cometa soil is on the younger land surfaces, and the Fiddyment on the older surfaces. In some areas the Cometa soil is in the higher positions and in other areas in the lower positions, depending on the geologic deposition and erosion cycle. In general, the surface of the Cometa soil has a brown cast and that of the Fiddyment has a yellower or grayer cast The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses and forbs.

About 10 percent of this unit is included areas of San Joaquin sandy loam, 10 percent is Kaseberg loam, 5 percent is Ramona sandy loam on scattered narrow ridges, and 5 percent is Alamo clay in some drainageways and basins.

The Cometa is a deep, well drained claypan soil that formed in alluvium, mainly from granitic sources.

Typically, the surface layer is brown sandy loam about 18 inches thick. The subsoil is brown clay At a depth of about 29 inches is compacted very pale brown sandy loam.

Permeability is very slow. The available water capacity is 4.0 to 6.0 inches. The effective rooting depth is 60 inches or more, but roots are restricted to cracks and faces of peds below a depth of 18 inches because of the dense clay subsoil. Surface runoff is slow. The hazard of erosion is slight. After intense rainstorms, the soil is saturated for a short time.

The Fiddyment is a well drained soil that is moderately deep over a hardpan. It formed in old valley fill siltstone.

Typically, the surface layer is light yellowish brown loam and silt loam about 12 inches thick. The subsoil is yellowish brown and brown dense clay loam. At a depth of 28 inches is silica-indurated siltstone.

Permeability is very slow. The available water capacity is 2.0 to 3.5 inches. The effective rooting depth is 20 to 37 inches. The dense subsoil restricts most roots, reducing the water available to plants. Surface runoff is slow. The hazard of erosion is slight. After intense rainstorms, the soil is saturated for a short time.

Most areas are used for winter grain. A few areas are used for irrigated pasture and rice. When grain prices are down, much of the grainland is used for annual rangeland. In the Roseville area, this unit is being subdivided for homesites.

To avoid compaction, these soils should not be cultivated or have equipment moved across them when wet, except in growing rice. Suitable irrigation methods are flood, border, or sprinkler.

After a grain crop these soils are usually fallowed in alternate years to conserve moisture and control weeds. Yields are low but can be improved by applications of nitrogen, especially if it is applied in both nitrate and ammonia form.

Irrigated pasture should consist of a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping. It responds to applications of nitrogen and phosphorus. Leveling for broader irrigation may expose hardpan on the Fiddyment soil and dense clay subsoil on the Cometa soil. The frequency of irrigation is about every 5 to 8 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

Flatter areas are well suited to rice. The soils need to be leveled so that water can be ponded. The hardpan under the Fiddyment soil and the clay subsoil and compacted substratum of the Cometa soil are nearly impervious to the downward movement of water. Water requirements for rice are about 1 cubic foot per second to 40 acres after the checks are flooded. Rice should be rotated with barley every 2 to 4 years to help control aquatic weeds and soil fungus.

This unit has fair potential for rangeland. Most rangeland is in poor condition because the forage is volunteer grasses, legumes, and forbs. Forage can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and by applying nitrogen, phosphorus, and sulfur. In a favorable year, the green feed

period is from about March 15 to June 1. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

Grainfields and rangeland have limited potential as habitat for mourning dove. Irrigated pasture and ricefields provide habitat for dove and pheasant. Ricefields provide good habitat for duck. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

The major limitations to construction on the Cometa soil are the very slow permeability of the subsoil, the shrink-swell potential of the soil, and the limited ability of the soil to support a load. The major limitations to construction on the Fiddyment soil are the very slow permeability of the subsoil, the moderate depth to hardpan, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset the shrink-swell potential and the low bearing strength of the soils. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the very slow permeability of the subsoil and substratum and the hardpan under the Fiddyment soil.

Capability unit IVe-3(17) irrigated and nonirrigated; Storie index 34.

142—Cometa-Ramona sandy loams, 1 to 5 percent slopes. These undulating soils are on low terraces in the Roseville area and west of Lincoln. They occur at elevations of 75 to 200 feet. The unit is about 50 percent Cometa soil and 30 percent Ramona soil. The Cometa soil is on short side slopes and bottoms, and the Ramona soil is on fingerlike ridges and younger land surfaces. The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses, forbs, and scattered oak.

About 10 percent of this unit is included areas of San Joaquin sandy loam, 5 percent is Fiddyment loam, and 5 percent is Alamo clay and areas of Xerofluvents in narrow drainageways.

The Cometa is a deep, well drained claypan soil that formed in alluvium, mainly from granitic sources.

Typically, the surface layer is brown sandy loam about 18 inches thick. The subsoil is brown clay. At a depth of about 29 inches is compacted very pale brown sandy loam.

Permeability is very slow. The available water capacity is 4.0 to 6.0 inches. The effective rooting depth is 60 inches or more, but roots are restricted to cracks and faces of peds below a depth of 18 inches because of the dense clay subsoil. Surface runoff is slow. The hazard of erosion is slight. After intense rainstorms, the soil is saturated for a short time.

The Ramona soil is very deep and well drained. It formed in alluvium from predominantly granitic sources.

Typically, the surface layer is brown and light brown sandy loam and loam about 14 inches thick. The subsoil is mixed reddish yellow and yellowish red sandy clay loam about 41 inches thick. The substratum to a depth of 73 inches is reddish yellow gravelly sandy loam.

Permeability is moderately slow. The available water capacity is 6.5 to 9.5 inches. The effective rooting depth is 60 or more inches. Roots extend into the lower granitic alluvium. Surface runoff is medium. The hazard of erosion is slight.

Most areas are used for winter grain. Some are irrigated pasture. Sometimes much of the grainland is used for annual rangeland. In a Roseville area, much of this unit is being subdivided.

To avoid compaction, this unit should not be cultivated or have equipment moved across it when it is wet. Border or sprinkler irrigation is suitable.

After a grain crop these soils are usually fallowed in alternate years to conserve moisture and control weeds. Yields are low to moderate but can be improved by applying nitrogen, especially if it is applied in both nitrate and ammonia form.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping. It responds to applications of nitrogen and phosphorus. Leveling for border irrigation may expose the dense clay subsoil of the Cometa soil. The frequency of irrigation is about every 7 to 10 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

This unit has fair potential for rangeland. Most rangeland is in poor condition because the forage is volunteer grasses, legumes, and forbs. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and by applying nitrogen, phosphorus, and sulfur. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

Grainfields and rangeland have limited potential as habitat for mourning dove. Irrigated pasture provides habitat for dove and pheasant. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

The major limitations to urban use of the Cometa soil are the very slow permeability of the subsoil, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. The major limitation to urban use of the Ramona soil is the moderately slow permeability of the subsoil. Dwelling and road construction can be designed to offset the shrink-swell potential and the low bearing strength of the Cometa soil. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the very slow permeability of the subsoil in the Cometa soil.

Capability unit IIIe-3(17) irrigated and nonirrigated; Storie index 50.

143—Dubakella very stony loam, 9 to 50 percent slopes. This is a moderately deep, well drained very stony soil underlain by ultrabasic rock. It formed in residuum in small, scattered areas of serpentinitic uplands in the eastern part of the survey area. Elevations are 1,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 57 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is brush, stunted conifer, and annual grasses.

About 20 percent of the acreage is included areas of a soil that is similar to this Dubakella soil but is only 10 to 20 inches deep to hard serpentine bedrock, 5 percent is Mariposa gravelly loam, and 10 percent is rock outcrop.

Typically, the surface layer of this Dubakella soil is reddish brown very stony loam and very cobbly loam about 17 inches thick. The subsoil is brown cobbly clay. At a depth of about 31 inches is weathered serpentinized rock.

Permeability is slow. The available water capacity is 2.0 to 4.0 inches. The effective rooting depth is 21 to 33 inches. Fertility is very low because of a calcium to magnesium imbalance. Surface runoff is medium to rapid. The hazard of erosion is moderate to high.

This soil is used mainly for watershed. Some areas are used for wood crops.

This soil is not well suited to ponderosa pine production. It is capable of producing about 44 cubic feet, or 87 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to production is a calcium to magnesium imbalance that causes a very low level of fertility. There is some problem with windthrow because of the clay subsoil. Timber should not be harvested unless harvest is beneficial to the appearance of the stand or the soil is part of a block that contains better timber soils. Reforestation after harvest must be managed to reduce competition from brush.

Brushy areas provide good cover habitat for blacktailed deer and black bear.

Steepness of slope, depth to rock, and a slowly permeable clay subsoil are the major limitations to be considered in planning cabin and road construction. Soil slumps can be a hazard to road cuts because of the low strength and the lateral movement of water in winter. Septic tank absorption fields are marginal because of the slowly permeable subsoil and the depth to hard serpentine rock.

Capability subclass VIIs(22) nonirrigated; Storie index 13.

144—Exchequer very stony loam, 2 to 15 percent slopes. This is a shallow, somewhat excessively drained very stony soil underlain by hard andesitic breccia. It formed in residuum on long, broad volcanic ridges at elevations of 100 to 2,000 feet. The average annual precipitation ranges from 20 to 35 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, and scattered blue and live oak.

About 15 percent of the acreage is included areas of Inks cobbly loam, 5 percent is a soil that is similar to the Inks soil but has a reddish brown loam subsoil, 5 percent is a shallow soil that has a brown clay subsoil, and 2 percent is areas of exposed andesitic breccia (lava cap) 10 to 50 square feet in size. Small areas of this Exchequer soil are strongly acid.

Typically, the soil is brown very stony loam and cobbly loam. At a depth of about 11 inches is hard andesitic breccia.

Permeability is moderate. The available water capacity is 0.5 to 2.5 inches. The effective rooting depth is 8 to 20 inches. Surface runoff is medium. The hazard of erosion is slight to moderate. After intense rainstorms, this soil is saturated and water flows across the surface for a short time.

Most areas are used for annual rangeland.

The major limitation to rangeland is the shallowness over rock. The grass is dry 1 to 2 weeks after the last spring rain. In a favorable year, the green feed period is from about March 15 to May 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

This soil has some potential as habitat for California quail and mourning dove.

Stones and the depth to hard rock are the major limitations to be considered in planning road construction. Septic tank absorption fields may not function properly because the depth to hard rock is less than 20 inches.

Capability subclass VIIs(18) nonirrigated; Storie index 15.

145—Exchequer-Rock outcrop complex, 2 to 30 percent slopes. This map unit is on long, broad volcanic ridges and their side slopes. It is about 60 percent Exchequer soil and 15 percent andesitic breccia (lava cap). Elevations are 100 to 1,000 feet. The average annual precipitation ranges from 20 to 35 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, and scattered blue and live oak.

About 10 percent of this unit is included areas of Inks cobbly loam, 5 percent is a soil that is similar to the Inks soil but has a reddish brown loam subsoil, and 5 percent is a shallow soil that has a brown clay subsoil. A few areas of this Exchequer soil are strongly acid.

The Exchequer is a shallow, somewhat excessively drained very stony soil that formed in residuum from hard andesitic breccia.

Typically, the soil is brown very stony loam and cobbly loam. At a depth of about 11 inches is hard andesitic breccia.

Permeability is moderate. The available water capacity is 0.5 to 2.5 inches. The effective rooting depth is 8 to 20 inches. Surface runoff is medium to rapid. The hazard of erosion is slight to high. After intense rainstorms, this soil is saturated and water flows across the surface for a short time.

Rock outcrop consists of areas of hard andesitic breccia 50 to 500 square feet.

Surface runoff is very rapid. There is no hazard of erosion.

Most areas are used for annual rangeland.

The major limitations to rangeland are the outcrops of rock and the shallow soil. The grass is dry 1 to 2 weeks after the last spring rain. The outcrop is essentially barren. In a favorable year, the green feed period is from about March 15 to May 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

This unit has some potential as habitat for California quail and mourning dove.

Steepness of slope, the rock outcrop, and the shallowness over hard rock are the major limitations to be considered in planning road construction. Septic tank absorption fields should not be planned on this unit because the soil material is not deep enough to install leach fields.

Capability subclass VIIs(18) nonirrigated; Storie index 12.

146—Fiddyment loam, 1 to 8 percent slopes. This is a moderately deep, well drained soil on low terraces of siltstone at elevations of 75 to 135 feet. The average annual precipitation is about 20 inches. The average annual temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses and forbs.

About 15 percent of this acreage is included areas of Kaseberg loam, 5 percent is Cometa sandy loam, and 5 percent is San Joaquin sandy loam. Alamo clay occurs in some drainageways and basins. East and west of Roseville, adjacent to the Sacramento County line, is about 600 acres of a soil that is similar to this Fiddyment soil but has a brown loam subsoil. On some ridges north of Pleasant Grove Creek and east of Brewer Road, the surface layer contains some chert gravel, possibly remnants of an older surface.

Typically, the surface layer of this Fiddyment soil is light yellowish brown loam and silt loam about 12 inches thick. The subsoil is brown and yellowish brown dense clay loam. At a depth of 28 inches is silica-indurated siltstone.

Permeability is very slow. The available water capacity is 2.0 to 3.5 inches. The effective rooting depth is 20 to 37 inches. The dense subsoil restricts most roots, reducing the water available to plants. Surface runoff is slow to medium. The hazard of erosion is slight to moderate. After intense rainstorms, the soil is saturated for a short time.

Most areas are used for winter grain. Sometimes much of the grainland is used for annual range. A few areas are used for irrigated pasture and forbs.

Erosion can be controlled by cultivating across the slope, especially where slopes are greater than 5 percent. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet, except in growing rice. Flood, border, or sprinkler irrigation is suitable.

After a grain crop, this soil is usually fallowed in alternate years to conserve moisture and control weeds. Yields are low but can be improved by applying nitrogen, especially if it is applied in both nitrate and ammonia form.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping. It responds to applications of nitrogen and phosphorus. Leveling for border irrigation may expose areas of the dense subsoil or the hardpan. The frequency of irrigation is about every 5 to 8 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

Flatter areas are well suited to rice. The soil needs to be leveled so that water can be ponded. The dense subsoil and the hardpan are nearly impervious to the downward movement of water. Water requirements for rice are about 1 cubic foot per second for 40 acres after the checks are flooded. Rice should be rotated with barley every 2 to 4 years to help control aquatic weeds and soil fungus.

This soil has fair potential for rangeland. Most rangeland is in poor condition because the forage is volunteer grasses, legumes, and forbs. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and by applying nitrogen, phosphorus, and sulfur. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

Grainfields and rangeland have limited potential as habitat for mourning dove. Irrigated pasture and ricefields provide habitat for dove and pheasant. Ricefields provide good habitat for duck. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

There is some use of this soil as rural subdivisions. The major limitations to urban use are the very slow permeability of the subsoil, the moderate depth to the hardpan, and the limited ability of the soil to support a load. Dwellings can be designed to offset the low bearing strength and the moderate depth to the hardpan. Septic tank absorption fields may not function properly because of the very slowly permeable subsoil and the shallowness over the hardpan

Capability unit IVe-3(17) irrigated and nonirrigated; Storie index 27.

147—Fiddyment-Kaseberg loams, 2 to 9 percent slopes. These undulating to gently rolling soils are on low siltstone terraces at elevations of 75 to 135 feet. The unit is about 50 percent Fiddyment soil and 30 percent Kaseberg soil. The Fiddyment soil is moderately deep over a hardpan, and the Kaseberg soil is shallow over a hardpan. The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses and forbs.

About 10 percent of this unit is included areas of Alamo clay in some swales and drainageways. North of Pleasant Grove Creek and east of Brewer Road, some ridges are covered with chert gravel, which is a remnant of an older surface. In the upper reaches of Pleasant Grove Creek, the soil profile in about 500 acres of this unit is 10 to 20 percent gravel and cobbles.

The Fiddyment is a well drained soil that is moderately deep over a hardpan. It formed in old valley fill siltstone.

Typically, the surface layer is light yellowish brown loam and silt loam about 12 inches thick. The subsoil is brown and yellowish brown dense clay loam. At a depth of 28 inches is silica-indurated siltstone.

Permeability is very slow. The available water capacity is 2.0 to 3.5 inches. The effective rooting depth is 20 to 37 inches. The dense subsoil restricts most roots, reducing the water available to plants. Surface runoff is slow to medium. The hazard of erosion is slight to moderate. After intense rainstorms, the soil is saturated for a short time.

The Kaseberg is a well drained soil that is shallow over a hardpan. It formed in old valley fill siltstone.

Typically, the surface layer is light brownish gray loam with yellowish brown mottles and is about 6 inches thick. The subsoil is pale brown loam about 8 inches thick. The underlying material is light gray silt loam. At about 16 inches is a silica-indurated hardpan 1 inch thick. It is underlain by siltstone.

Permeability is moderate. The available water capacity is 1.5 to 3.5 inches. The effective rooting depth is 10 to 20 inches. Surface runoff is slow to medium. The hazard of erosion is slight to moderate. After intense rainstorms, the soil is saturated for a short time.

Most areas are used for winter grain. Sometimes much of the grainland is used for annual range.

Erosion can be controlled by cultivating across the slope, especially where slopes are greater than 5 percent. To avoid compaction, this unit should not be cultivated or have equipment moved across it when wet.

After a grain crop, this unit is usually fallowed in alternate years to conserve moisture and control weeds. Yields are low, but can be improved by applying nitrogen, especially if it is applied in both nitrate and ammonia form.

This unit has fair potential for rangeland. Most rangeland is in poor condition because the forage is volunteer grasses, legumes, and forbs. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and by applying nitrogen, phosphorus, and sulfur. In a favorable year, the green feed period is from about March 15 to May 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

Grain fields and rangeland have limited potential as habitat for mourning dove. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas

This unit supports little construction except for farmsteads. The major limitations to urban use of the Fiddyment soil are the very slow permeability of the subsoil, the moderate depth to the hardpan and siltstone, and the limited ability of the soil to support a load. The Kaseberg soil is limited by the shallowness over the hardpan and siltstone. Septic tank absorption fields may

not function properly because the depth to the hardpan and the underlying siltstone ranges from 10 to 37 inches.

Capability unit IVe-3(18) nonirrigated; Storie index 24.

148—Henneke-Rock outcrop complex, 5 to 50 percent slopes. These rolling to steep soils are on serpentine foothills in discontinuous belts at elevations of 1,200 to 1,700 feet. The unit is about 60 percent Henneke soil and 20 percent serpentine Rock outcrop. The average annual precipitation ranges from 30 to 40 inches. The average annual air temperature is about 60 degrees F. The average frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, chamise, and scattered Digger pine.

About 10 percent of this unit is included areas of a soil that is similar to this Henneke soil but has a loam and clay loam subsoil, and 10 percent is a soil that is also similar to this Henneke soil but its subsoil is less than 35 percent rock fragments.

The Henneke is a shallow, well drained soil that formed in residuum from hard serpentine rock.

Typically, the surface layer is reddish brown gravelly loam about 3 inches thick. The subsoil is yellowish red very gravelly clay loam and reddish brown very gravelly clay. At a depth of about 18 inches is serpentine rock.

Permeability is moderately slow. The available water capacity is 0.5 to 2.0 inches. The effective rooting depth is 10 to 20 inches. Fertility is very low because of a calcium to magnesium imbalance. Surface runoff is medium to rapid. The hazard of erosion is high.

Rock outcrop consists of areas of hard serpentine rock ranging up to 2 acres.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is better suited to watershed than to other uses because of the very low fertility, the rock outcrop, and the slope.

Brushy areas provide some cover for wildlife.

The rock outcrop, slope, very low fertility, and shallowness over hard rock are the major limitations to development of this unit. Septic tank absorption fields may not function properly because the depth to hard rock is less than 20 inches.

Capability subclass VIIIs(18) nonirrigated; Storie index 9.

149—Horseshoe gravelly loam, 2 to 9 percent slopes. This is a very deep, well drained gravelly soil on tertiary river terraces. It formed in alluvium from mixed sources. The alluvium is high in content of gravel and cobble sized quartz, chert, and other resistant minerals and rocks. Elevations are 3,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 50 to 60 inches. The average annual air temperature is about 57 degrees F. The average frost-free season is between 170 and 225 days. Natural vegetation is conifer-hardwood forest.

About 5 percent of the acreage is included areas of Aiken loam, 5 percent is Cohasset loam, and 10 percent is tailing areas, a result of hydraulic mining.

Typically, the surface layer of this Horseshoe soil is mixed dark grayish brown and brown gravelly loam about 18 inches thick. The subsoil is yellowish red and red gravelly heavy loam and gravelly clay loam about 50 inches thick. The underlying material is yellowish red gravelly clay loam. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 6.0 to 9.5 inches. The effective rooting depth is 60 inches or more, but most roots are in the upper 40 inches and tend to mat obliquely in the subsoil. Surface runoff is medium. The hazard of erosion is slight.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and by using cover crops in orchards in winter. Gravel causes minor problems in tilling. To avoid compaction, the soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass and Blando bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In apple orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing perennial grasses, such as Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. Legumes are not recommended as a cover crop in apple orchards because excess nitrogen causes poor fruit coloring.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Horseshoe soil is one of the best soils in the area for the production of ponderosa pine. It is suited to

highly intensive management. It is capable of producing about 125 cubic feet, or 700 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards and vineyards.

Homesite construction--primarily vacation homes--is increasing on this Horseshoe soil. The major limitations to urban use are the shrink-swell potential of the subsoil and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderate permeability of the subsoil.

Capability units IIe-1(22) irrigated, IIIe-1(22) nonirrigated; Storie index 58.

150—Horseshoe gravelly loam, 9 to 30 percent slopes. This is a very deep, well drained gravelly soil on side slopes of tertiary river terraces. It formed in alluvium from mixed sources. The alluvium is high in content of gravel and cobble sized quartz, chert, and other resistant minerals and rocks. Elevations are 3,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 50 to 60 inches. The average annual air temperature is about 57 degrees F. The average frost-free season is between 170 and 225 days. Natural vegetation is conifer-hardwood forest.

About 5 percent of the acreage is included areas of Josephine loam, 5 percent is Cohasset loam, and 5 percent is tailing areas, a result of hydraulic mining.

Typically, the surface layer of this Horseshoe soil is mixed dark grayish brown and brown gravelly loam about 18 inches thick. The subsoil is yellowish red and red gravelly heavy loam and gravelly clay loam about 50 inches thick. The underlying material is yellowish red gravelly clay loam. In a few places, the surface layer is loam.

Permeability is moderate. The available water capacity is 6.0 to 9.5 inches. The effective rooting depth is 60 inches or more, but most roots are in the upper 40 inches and tend to mat obliquely in the subsoil. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by using permanent cover in orchards. Cultivation to establish permanent cover should be across the slope. Orchards should be planted and worked across the slope. To avoid compaction, the soil should not be worked when wet. The gravel and slope make cultivation somewhat difficult. Sprinklers should be used in irrigating.

In apple orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing perennial grasses, such as Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. Legumes are not recommended as a cover crop in apple orchards because excess nitrogen causes poor fruit coloring.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples may require small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Horseshoe soil is one of the best soils in the area for the production of ponderosa pine. It is suited to highly intensive management. It is capable of producing about 125 cubic feet, or 700 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 12 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be

established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Horseshoe soil. The major limitations to urban use are the slope, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset the shrink-swell potential and the limited ability to support a load. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope and the moderate permeability of the subsoil.

Capability unit IVe-1(22) irrigated and nonirrigated; Storie index 49.

151—Horseshoe-Rubble land complex, 2 to 30 percent slopes. This gently sloping soil and Rubble Land are on tertiary river terraces and their side slopes. The unit is about 45 percent Horseshoe soil and 40 percent Rubble land. The Horseshoe soil adjoins and often is isolated by deep, vertically walled hydraulic mine pits. Rubble land is the waste material left in the pit bottoms. Elevations are 3,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 50 to 60 inches. The average annual temperature is about 57 degrees F. The average frost-free season is between 170 and 225 days. Natural vegetation is conifer-hardwood forest, with brush, stunted trees, and barren areas on the tailings.

About 5 percent of this unit is included areas of Aiken loam, 5 percent is Cohasset loam, and 5 percent is Josephine loam.

The Horseshoe is a very deep, well drained gravelly soil that formed in alluvium from mixed sources. The alluvium is high in content of gravel and cobble sized quartz, chert, and other resistant minerals and rocks.

Typically, the surface layer is mixed dark grayish brown and brown gravelly loam about 18 inches thick. The subsoil is yellowish red and red gravelly heavy loam and gravelly clay loam about 50 inches thick. The underlying material is yellowish red gravelly clay loam. In some areas, the surface layer has been removed by bulldozing and leveling, and the profile characteristics have been altered by mechanical manipulation and erosion.

Permeability is moderate. The available water capacity is 6.0 to 9.5 inches. The effective rooting depth is 60 inches or more, but most roots are in the upper 40 inches and tend to mat obliquely in the subsoil. Surface runoff is medium or rapid. The hazard of erosion is slight to high.

Rubble land consists of areas that have been hydraulically mined and washed with extremely powerful streams of water, leaving pits with steep, clifflike sides and bottoms that are irregularly shaped. The surface area is 90 to 100 percent stones, cobbles, and gravel. Some areas have sufficient fine soil material, together with small tracts of less disturbed areas, to retain somewhat the characteristics of the Horseshoe soil and support tree growth.

The available water capacity is variable. Surface runoff is rapid. The hazard of erosion is variable.

This unit is used mainly for wood crops and watershed.

The Horseshoe soil is well suited to ponderosa pine production. It is capable of producing about 125 cubic feet, or 700 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Rubble land in this unit has little value for wood crop production. Conventional methods can be used in tree harvest, but their use may be restricted in winter. The major limitation to timber production is the need to work around the tailing areas. Roads and skid trails should be protected from runoff. Grades of unsurfaced roads should be less than 12 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to the Horseshoe soil. Pruning is needed to reduce excessive growth between whorls.

Rubble land and open areas have fair potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

There is some construction of vacation homes. The Rubble land part of the unit should be used only for construction of access roads. The major limitations of the Horseshoe soil are the slope, the shrink-swell potential, and the limited ability of the soil to support a load.

Capability subclass VIIs(18) nonirrigated; Storie index 30.

152—Inks cobbly loam, 2 to 30 percent slopes. This is a shallow, well drained cobbly soil underlain by andesitic conglomerate. It formed in residuum on long broad volcanic ridges and side slopes at elevations of 200 to 1,200 feet. The average annual precipitation ranges from 20 to 35 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, and blue and live oak.

About 10 percent of the acreage is included areas of Inks Variant cobbly loam, and 10 percent is Exchequer very stony loam. In a few places, the surface layer of this Inks soil is reddish brown.

Typically, the surface layer is yellowish brown cobbly loam about 5 inches thick. The subsoil is brown very cobbly clay loam. At a depth of about 18 inches is andesitic conglomerate.

Permeability is moderate. The available water capacity is 1.0 to 2.5 inches. The effective rooting depth is 12 to 20 inches. Surface runoff is medium or rapid. The hazard of erosion is slight to high.

Most areas are used for annual rangeland. A few are irrigated pasture.

To control erosion, tilling should be across the slope. Cobbles make cultivation difficult. To avoid compaction, the soil should not be worked when wet. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Range legumes respond to applications of sulfur.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4 inches of water is applied at each irrigation. The freqency of irrigation is every 5 to 8 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential for rangeland. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to June 1 Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food.

Some rural housing has been developed on this soil. The major limitations to rural development are the slope and the depth to rock. Septic tank absorption fields may not function properly because of the slope and the depth to rock, which is generally less than 20 inches.

Capability unit IVe-8(18) irrigated and nonirrigated; Storie index 21

153—Inks cobbly loam, 30 to 50 percent slopes. This is a shallow, well drained cobbly soil underlain by andesitic conglomerate. It formed in residuum on side slopes of long, broad volcanic ridges at elevations of 200 to 1,200 feet The average annual precipitation ranges from 20 to 35 inches. The average annual air temperature is about 61 degrees F The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, and blue and live oak.

About 25 percent of the acreage is included areas of Inks Variant cobbly loam, and 5 percent is Exchequer very stony loam.

Typically, the surface layer of this Inks soil is yellowish brown cobbly loam about 5 inches thick. The subsoil is brown very cobbly clay loam. At a depth of 18 inches is andesitic conglomerate. In a few places, the surface layer is reddish brown gravelly loam.

Permeability is moderate. The available water capacity is 1.0 to 2.5 inches. The effective rooting depth is 12 to 20 inches. Surface runoff is rapid. The hazard of erosion is high.

Most areas are used for annual rangeland.

The major limitation to rangeland is the slope. Uniform grazing is difficult to achieve because livestock tend to trail around the slope. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey.

Steepness of slope and the depth to rock are the major limitations to be considered in planning home and road construction.

Capability subclass VIe(18) nonirrigated; Storie index 11.

154—Inks-Exchequer complex, 2 to 25 percent slopes. This map unit is on long, broad volcanic ridges and side slopes at elevations of 200 to 1,200 feet. It is about 40 percent Inks soil and 30 percent Exchequer soil. The soil pattern generally follows the pattern of oak trees. The Inks soil supports a denser stand of oaks than does the Exchequer soil. The average annual precipitation ranges from 20 to 35 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, and blue and live oak

About 10 percent of this unit is included areas of a soil that is similar to the Inks soil but lacks cobbles in the subsoil and is 12 to 26 inches deep to bedrock, 10 percent is a soil that is similar to the Exchequer soil but has a loam subsoil, and 5 percent is a shallow soil with a brown clay subsoil. Along the contact with the volcanic flows and the terraces, 5 percent is scattered areas of terrace remnants, moderately deep cobbly alluvium, and Alamo variant clay.

The Inks is a shallow, well drained cobbly soil that formed in residuum from andesitic conglomerate.

Typically, the surface layer is yellowish brown cobbly loam about 5 inches thick. The subsoil is brown very cobbly clay loam. At a depth of 18 inches is andesitic conglomerate. In a few places, the surface layer is gravelly loam.

Permeability is moderate. The available water capacity is 1.0 to 2.5 inches. The effective rooting depth for most plants is 12 to 20 inches. Oak roots follow fracture planes for many feet in the conglomerate. The surface runoff is medium. The hazard of erosion is slight or moderate. After intense rainstorms, this soil is saturated and water flows across the surface.

The Exchequer is a shallow somewhat excessively drained very stony soil that formed in residuum from hard andesitic breccia.

Typically, the soil is brown very stony loam and cobbly loam. At a depth of 11 inches is hard andesitic breccia.

Permeability is moderate. The available water capacity is 0.5 to 2.5 inches. The effective rooting depth is 8 to 20 inches. Surface runoff is medium. The hazard of erosion is slight or moderate. After intense rainstorms, this soil is saturated and water flows across the surface.

This unit is used mainly for annual rangeland. Selected areas are irrigated pasture.

To control erosion, this unit should be tilled across the slope to establish permanent cover. Cobbles and stones make cultivation difficult. To avoid compaction, the soil should not be worked when wet. Sprinklers should be used in irrigating.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Range legumes respond to applications of sulfur.

On pasture, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2 to 4 inches of water is applied at each irrigation. The frequency of irrigation is every 5 to 8 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit has good potential for rangeland. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch. In a favorable year, the green feed period is from about March 15 to June 1 on the Inks soil and from about March 15 to May 15 on the Exchequer soil. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Open areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

Some rural housing has been developed on this unit. The major limitations to rural development are the slope and the depth to rock. Septic tank absorption fields may not function properly because of the slope and the depth to rock, which is generally less than 20 inches.

Capability subclass VIs(18) irrigated and nonirrigated; Storie index 18.

155—Inks Variant cobbly loam, 2 to 30 percent slopes. This is a moderately deep or deep, well drained cobbly soil underlain by andesitic conglomerate. It formed in residuum on long, broad volcanic ridges and side slopes at elevations of 800 to 1,200 feet. The average annual precipitation ranges from 30 to 35 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 20 percent of the acreage is included areas of Inks cobbly loam.

Typically, the surface layer of the Inks variant is dark brown and brown cobbly loam about 17 inches thick. The subsoil is yellowish red and reddish brown very cobbly clay loam. At a depth of about 51 inches is weathered andesitic conglomerate.

Permeability is moderate. The available water capacity is 2.5 to 6.5 inches. The effective rooting depth is 30 to 54 inches. Surface runoff is medium or rapid. The hazard of erosion is slight to high.

This soil is used mainly for annual rangeland and irrigated pasture. It is also suited to deciduous orchards. A few areas have been converted to rural housing.

Erosion can be controlled by cultivating across the slope. Cover crops should be used in winter. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may require small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3 to 5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential for rangeland. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch and improved perennial dryland grasses, such as Perlagrass. They should be planted in a well prepared seedbed. In a favorable year, the green feed period is from March 15 to June 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail and mourning dove. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards.

There is an increasing use of this soil for rural subdivisions. The major limitations to urban use are cobbles, the slope, and the depth to rock. In locating roads on the steeper slopes, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the depth to rock.

Capability unit IVe-1(18) irrigated and nonirrigated; Storie index 36.

156—Iron Mountain-Rock outcrop complex, 2 to 30 percent slopes. This map unit is in scattered narrow benches on long volcanic ridges at elevations of 3,000 to 5,000 feet. It is about 45 percent Iron Mountain soil and 40 percent volcanic Rock outcrop (lava cap). The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 54 degrees F. The average frost-free season is between 150 and 230 days. Natural vegetation is annual grasses, brush, and stunted conifer.

About 10 percent of this unit is included areas of McCarthy cobbly sandy loam, and 5 percent is Cohasset cobbly loam.

The Iron Mountain is a shallow, somewhat excessively drained cobbly soil that formed in residuum from hard andesitic tuff-breccia.

Permeability is moderately rapid. The effective rooting depth is 5 to 20 inches. The available water capacity is 0.5 to 2.0 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Rock outcrop consists of areas of hard andesitic tuff-breccia, commonly called lava cap. Areas are 50 to 500 square feet.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is better suited to watershed than to other uses because of the shallow soil and Rock outcrop. It supplies open areas for access to the wildlife habitat in adjacent units.

Steepness of slope, Rock outcrop, and the depth to hard rock are the major limitations to be considered in planning road construction. Homesites should not be planned on this unit because the soil material is not deep enough to install septic tank absorption fields.

Capability subclass VIIs(22) nonirrigated; Storie index 10.

157—Josephine loam, 2 to 9 percent slopes. This is an undulating to gently rolling, deep, well drained soil underlain by weathered metamorphic rock. It formed in residuum, mainly from metasedimentary rock, on ridges or foot slopes at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest, brush, forbs, and grasses.

About 10 percent of the acreage is included areas of Mariposa gravelly loam, 5 percent is Boomer loam, 5 percent is Sites loam, and 2 percent is scattered rock outcrop.

Typically, the surface layer of this Josephine soil is brown loam, about 11 inches thick. The subsoil is reddish yellow clay loam and silty clay loam. At a depth of about 52 inches is weathered slate.

Permeability is moderately slow. The available water capacity is 5.5 to 11.0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is medium. The hazard of erosion is slight.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected

varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Josephine soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management It is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvesting, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas Protective strip plantings of grain provide food. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Josephine soil. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability.

Capability units IIe-1(22) irrigated, IIIe-1(22) nonirrigated; Storie index 69.

158—Josephine loam, 9 to 15 percent slopes. This is a deep, rolling, well drained soil underlain by weathered metamorphic rock. It formed in residuum, mainly from metasedimentary rock, on ridges or foot slopes at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest, brush, forbs, and grasses.

About 10 percent of the acreage is included areas of Boomer loam, 10 percent is Mariposa gravelly loam, 5 percent is Sites loam, and 2 percent is scattered rock outcrop.

Typically, the surface layer of this Josephine soil is brown loam about 11 inches thick. The subsoil is reddish yellow clay loam and silty clay loam. At a depth of about 52 inches is weathered slate.

Permeability is moderately slow. The available water capacity is 5.5 to 11 0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is medium. The hazard of erosion is moderate.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass and Blando bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchard-

grass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Josephine soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip plantings of grain provide food. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Josephine soil. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability.

Capability unit IIIe-1(22) irrigated and nonirrigated; Storie index 62.

159—Josephine loam, 15 to 30 percent slopes. This is a deep, well drained soil underlain by weathered metamorphic rock. It formed in residuum, mainly from metasedimentary rock, on hilly uplands at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest, brush, forbs, and grasses.

About 10 percent of the acreage is included areas of Boomer loam, 10 percent is Mariposa gravelly loam, 5 percent is Sites loam, and 2 percent is scattered rock outcrop.

Typically, the surface layer of this Josephine soil is brown loam about 11 inches thick. The subsoil is reddish yellow clay loam and silty clay loam. At a depth of about 52 inches is weathered slate.

Permeability is moderately slow. The available water capacity is 5.5 to 11.0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by using permanent cover in the orchards. Cultivation to establish permanent cover should be across the slope. Orchards should be planted and worked across the slope. To avoid compaction, the soil should not be worked when wet. The slope makes cultivation difficult. Sprinklers should be used in irrigating.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Josephine soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management. It is capable of producing about 130

cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Josephine soil. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability of the soil to support a load. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope and the moderately slow permeability.

Capability unit IVe-1(22) irrigated and nonirrigated; Storie index 54.

160—Josephine loam, 30 to 50 percent slopes. This is a deep, steep, well drained soil underlain by weathered metamorphic rock. It formed in residuum, mainly from metasedimentary rock, on mountainous uplands at elevations of 2,000 to 4,500 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 150 and 230 days. Natural vegetation is conifer-hardwood forest and brush.

About 15 percent of the acreage is included areas of Mariposa gravelly loam, 10 percent is Boomer loam, 5 percent is Sites loam, and 5 percent is scattered rock outcrop.

Typically, the surface layer of this Josephine soil is brown loam about 11 inches thick. The subsoil is reddish yellow clay loam and silty clay loam. At a depth of about 52 inches is weathered slate.

Permeability is moderately slow. The available water capacity is 5.5 to 11.0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is rapid. The hazard of erosion is high.

This soil is used mainly for wood crops.

This Josephine soil is well suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope. Conventional methods used in tree harvest can be used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the high erosion hazard. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants. Christmas trees can be grown on this soil. Pruning is needed to reduce excessive growth between whorls.

Forested areas provide good habitat for black-tailed deer, black bear, band-tailed pigeon, wild turkey, and gray squirrel.

Steepness of slope is the major limitation to be considered in planning home and road construction. Soil slumps can be a hazard in road cuts because of low strength and the lateral movement of water in winter.

Capability subclass VIe(22) nonirrigated; Storie index 31.

161—Josephine-Rock outcrop complex, 15 to 50 percent slopes. This hilly to steep soil and Rock outcrop are on mountainous uplands at elevations of 2,000 to 4,500 feet. The unit is about 60 percent Josephine soil and 10 percent metamorphic Rock outcrop. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 150 and 230 days. Natural vegetation is conifer-hardwood forest and brush.

About 15 percent of this unit is included areas of Mariposa gravelly loam, 10 percent is Boomer loam, mainly on the south-facing side slopes, and 5 percent is Sites loam.

The Josephine is a deep, well drained soil that formed in residuum from metasedimentary rock.

Typically, the surface layer is brown loam about 11 inches thick. The subsoil is reddish yellow clay loam and silty clay loam. At a depth of about 52 inches is weathered slate.

Permeability is moderately slow. The available water capacity is 5.5 to 11.0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Rock outcrop consists of scattered areas of exposed metamorphic rock, ranging in size from about 1 to 10 square feet.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is used mainly for wood crops.

This unit is well suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope. Rock outcrop does not appreciably affect the use of this unit. Conventional methods used in tree harvest can be used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the high erosion hazard. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants. Christmas trees can be grown on this unit. Pruning is needed to reduce excessive growth between whorls.

This unit provides good habitat for black bear, black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

Steepness of slope and Rock outcrop are the major limitations to be considered in planning home and road construction. Soil slumps can be a hazard in road cuts because of low strength and the lateral movement of water in winter.

Capability subclass VIs(22) nonirrigated; Storie index 35.

162—Kilaga loam. This is a very deep, nearly level, well drained soil on alluvial bottoms and low terraces. It occurs mainly at elevations of 75 to 150 feet. It formed in alluvium from mixed sources. The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 275 days. Natural vegetation is annual grasses, forbs, and scattered valley oak.

About 10 percent of the acreage is included areas of Ramona sandy loam, 10 percent is Cometa sandy loam, 5 percent is San Joaquin sandy loam, and 5 percent is Xerofluvents, occasionally flooded. Also included are some areas where the soil is moderately well drained as a result of nearby irrigation.

Typically, the surface layer is strong brown loam and heavy loam about 19 inches thick. The upper 37 inches of the subsoil is reddish brown clay loam and clay. The lower part to a depth of about 83 inches is reddish brown sandy clay loam.

Permeability is slow. The available water capacity is 8.0 to 10.0 inches. The effective rooting depth is 60 inches or more. Surface runoff is slow. The hazard of erosion is slight.

Most areas are irrigated pasture. Some areas are used for field corn and rice.

To avoid compaction, this soil should not be cultivated or have equipment moved across it when it is wet, except in growing rice. Flood, border, or furrow irrigation is suitable. Corn responds to applications of nitrogen, phosphorus, and potassium.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping. It responds to applications of nitrogen and phosphorus. The frequency of irrigation is about every 8 to 14 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

This soil is suited to rice. It needs to be leveled so that water can be efficiently ponded. Generally, the water requirements for rice are about 1 cubic foot per second for 40 acres after the checks are flooded. Rice should be rotated with barley every 2 to 4 years to help control aquatic weeds and soil fungus.

Irrigated pasture, cornfields, and ricefields provide habitat for dove and pheasant. Ricefields provide good habitat for duck. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

This soil supports little construction except for farmsteads. The major limitations to construction are the slow permeability of the subsoil and the shrink-swell potential of the soil. Dwelling and road construction can be designed to offset these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of slow permeability in the subsoil.

Capability units IIs-3(17) irrigated, IIIs-3(17) nonirrigated; Storie index 54.

163—Mariposa gravelly loam, 5 to 30 percent slopes. This is a shallow or moderately deep, rolling to hilly, well drained gravelly soil underlain by fractured vertically tilted schist and slate. It formed in residuum, mainly from metasedimentary rock, on uplands at elevations of 1,500 to 3,500 feet. The average annual precipitation, some of which falls as snow, ranges from 35 to 55 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest and scattered brush and grasses.

About 10 percent of the acreage is included areas of Josephine loam, 5 percent is Sites loam, and 5 percent is Maymen gravelly loam, which occurs on few ridgetops. About 2 percent is scattered rock outcrop.

Typically, the surface layer of this Mariposa soil is brown gravelly loam about 6 inches thick. The subsoil is reddish yellow gravelly silt loam and gravelly clay loam. At a depth of about 28 inches is partially weathered, highly fractured slate.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 15 to

35 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by using permanent cover in the orchards. Cultivation should be across the slope. To avoid compaction, this soil should not be worked when wet. Gravel and the slope make tilling difficult. Sprinklers should be used in irrigating.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2.0 to 3.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Mariposa soil is well suited to ponderosa pine production. It is capable of producing about 93 cubic feet, or 486 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used for tree harvest, but their use may be restricted in winter. There is some problem of windthrow because of the shallowness of the soil. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are suited to this soil.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards.

Homesite construction—primarily vacation homes—is increasing on this Mariposa soil. The major limitations to urban use are the slope and the depth to rock. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope and the depth to rock.

Capability unit IVe-8(22) irrigated and nonirrigated; Storie index 33.

164—Mariposa-Josephine complex, 5 to 30 percent slopes. These rolling to hilly soils are on mountainous uplands at elevations of 1,500 to 4,000 feet. The unit is about 55 percent Mariposa soil and 35 percent Josephine soil. Generally, the Mariposa soil is on the ridges, the sharp breaks, and the south- and west-facing side slopes. In places the Josephine soil has concave slopes. In other places, it occupies smooth north- and east-facing side slopes. The average annual precipitation, some of which falls as snow, ranges from 35 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest and scattered brush and grasses.

About 8 percent of this unit is included areas of Sites loam, and 2 percent is scattered areas of rock outcrop.

The Mariposa is a shallow or moderately deep, well drained gravelly soil that formed in residuum from fractured vertically tilted schist and slate.

Typically, the surface layer is brown gravelly loam about 6 inches thick. The subsoil is reddish yellow gravelly silt loam and gravelly clay loam. At a depth of 28 inches is partially weathered, highly fractured slate.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 15 to 35 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

The Josephine is a deep, well drained soil that formed in residuum from metamorphic rock.

Typically, the surface layer is brown loam about 11 inches thick. The subsoil is reddish yellow clay loam and silty clay loam. At a depth of about 52 inches is weathered slate.

Permeability is moderately slow. The available water capacity is 5.5 to 11.0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by using permanent cover in the orchards. All cultivation should be across the slope. To avoid compaction, the soil should not be worked when wet. The gravel and the slope make tilling difficult. Sprinklers should be used in irrigating.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may require small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2.0 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 12 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This unit is well suited to ponderosa pine production. It is suited to moderately intensive management and is capable of producing about 111 cubic feet, or 617 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Windthrow is a hazard because of the shallowness of the Mariposa soil. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this unit. Pruning can reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards.

Homesite construction—primarily vacation homes—is increasing on this unit. The major limitations to urban use are the slope and the depth to rock. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope and the depth to rock. They should be installed on the Josephine part of the unit if possible.

Capability unit IVe-8(22) irrigated and nonirrigated; Storie index 43.

165—Mariposa-Josephine complex, 30 to 50 percent slopes. These steep soils are on mountainous uplands at elevations of 1,500 to 4,000 feet. The unit is about 50 percent Mariposa soil and 35 percent Josephine soil. Generally, the Mariposa soil is on the ridges, the sharp breaks, and the south- and west-facing side slopes. In places, the Josephine soil has concave slopes. In other places, it is on smooth north- and east-facing side slopes. The average annual precipitation, some of which falls as snow, ranges from 35 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 150 and 225 days. Natural vegetation is conifer-hardwood forest and scattered brush.

About 10 percent of this unit is included areas of Sites loam, and 5 percent is scattered areas of rock outcrop.

Mariposa is a shallow or moderately deep, well drained gravelly soil that formed in residuum from fractured, vertically tilted schist and slate.

Typically, the surface layer is brown gravelly loam about 6 inches thick. The subsoil is reddish yellow gravelly silt loam and gravelly clay loam. At a depth of about 28 inches is partly weathered, highly fractured slate.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 15 to 35 inches. Surface runoff is rapid. The hazard of erosion is high.

The Josephine is a deep, well drained soil that formed in residuum from metamorphic rock.

Typically, the surface layer is brown loam about 11 inches thick. The subsoil is reddish yellow clay loam and silty clay loam. At a depth of about 52 inches is weathered slate.

Permeability is moderately slow. The available water capacity is 5.5 to 11.0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is rapid. The hazard of erosion is high.

This unit is used for wood crops. It is well suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 111 cubic feet, or 617 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope. Windthrow is a hazard because of the shallowness of the Mariposa soil. Conventional methods used in tree harvest can be used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the high erosion hazard. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be

managed to reduce competition from undesirable plants. Christmas trees can be grown on this unit. Pruning can reduce excessive growth between whorls.

This unit provides good habitat for black bear, black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

Steepness of slope and the depth to rock are the major limitations to be considered in planning home and road construction. Soil slumps can be a hazard in road cuts on the Josephine soil because of low strength and the lateral movement of water in winter.

Capability subclass VIe(22) nonirrigated; Storie index 23.

166—Mariposa-Josephine complex, 50 to 70 percent slopes. These very steep soils are on canyon walls at elevations of 1,500 to 4,500 feet. The unit is about 45 percent Mariposa soil and 30 percent Josephine soil. Generally, the Mariposa soil is on the ridges, the sharp breaks, and the south- and west-facing side slopes. In places, Josephine soil has concave slopes. In other places, it is on smooth north- and east-facing side slopes. The average annual precipitation, some of which falls as snow, ranges from 35 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 150 and 225 days. Natural vegetation is conifer-hardwood forest and scattered brush.

About 10 percent of this unit is included areas of Maymen gravelly loam, 5 percent is Sites loam, and 10 percent is areas of scattered rock outcrop.

The Mariposa is a shallow or moderately deep, well drained gravelly soil that formed in residuum from fractured, vertically tilted schist and slate.

Typically, the surface layer is brown gravelly loam about 6 inches thick. The subsoil is reddish yellow gravelly silt loam and gravelly clay loam. At a depth of about 28 inches is partly weathered, highly fractured slate.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 15 to 35 inches. Surface runoff is rapid. The hazard of erosion is very high.

The Josephine is a deep, well drained soil that formed in residuum from metamorphic rock.

Typically, the surface layer is brown loam about 11 inches thick. The subsoil is reddish yellow clay loam and silty clay loam. At a depth of about 52 inches is weathered slate.

Permeability is moderately slow. The available water capacity is 5.5 to 11.0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is rapid. The hazard of erosion is very high.

This unit is used for wood crops and watershed. It is suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 111 cubic feet, or 617 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the steep slope. Windthrow is a hazard on the shallow Mariposa soil. Conventional methods used in tree harvest can be used only with great difficulty because of the slope. The slope can also be damaging to the soil resource because of the very high erosion hazard. High lead, balloon, or helicopter logging is the most efficient because damage to the soil surface by equipment is held to a minimum. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants.

This unit provides habitat for black bear, black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

Capability subclass VIIe(22) nonirrigated; Storie index 14.

167—Mariposa-Rock outcrop complex, 5 to 50 percent slopes. This gently rolling to steep soil and Rock outcrop are on mountainous uplands at elevations of 1,500 to 4,500 feet. The unit is about 65 percent Mariposa soil and 10 percent Rock outcrop. The average annual precipitation, some of which falls as snow, ranges from 35 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest and scattered brush and grasses.

About 15 percent of this unit is included areas of Josephine loam, 5 percent is Maymen gravelly loam, and 5 percent is Sites loam.

The Mariposa is a shallow or moderately deep, well drained gravelly soil that formed in residuum from fractured vertically tilted schist and slate.

Typically, the surface layer is brown gravelly loam about 6 inches thick. The subsoil is reddish yellow gravelly silt loam and gravelly clay loam. At a depth of about 28 inches is partly weathered, highly fractured slate.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 15 to 35 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Rock outcrop consists of scattered areas of exposed metamorphic rock, generally 1 to 2 square feet, but some areas cover up to 500 square feet.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is used mainly for wood crops. It is well suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 85 cubic feet, or 425 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber producton is the slope. Windthrow is a hazard because of the shallowness of the Mariposa soil. The outcrops of rock do not appreciably affect the use of this unit. Conventional methods used in tree harvest can be

used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the high erosion hazard. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants. Christmas trees can be grown on this Mariposa soil.

This unit provides good habitat for black bear, black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

Steepness of the slope, the depth to rock, and the rock outcrop are the major limitations to be considered in planning home and road construction.

Capability subclass VIs(22) nonirrigated; Storie index 22.

168—Mariposa-Rock outcrop complex, 50 to 70 percent slopes. This very steep soil and Rock outcrop are on canyon walls at elevations of 1,500 to 4,500 feet. The unit is about 60 percent Mariposa soil and 15 percent Rock outcrop. The average annual precipitation, some of which falls as snow, ranges from 35 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest and scattered brush and grasses.

About 10 percent of this unit is included areas of Josephine loam, 10 percent is Maymen gravelly loam, and 5 percent is Sites loam.

The Mariposa is a shallow or moderately deep, well drained gravelly soil that formed in residuum from fractured vertically tilted schist and slate.

Typically, the surface layer is brown gravelly loam about 6 inches thick. The subsoil is reddish yellow gravelly silt loam and gravelly clay loam. At a depth of about 28 inches is partly weathered, highly fractured slate.

Permeability is moderate. The available water capacity is 1.5 to 5.0 inches. The effective rooting depth is 15 to 35 inches. Surface runoff is rapid. The hazard of erosion is very high.

Rock outcrop consists of scattered areas of exposed metamorphic rock, generally 1 to 2 square feet, but in some areas it covers up to one-half acre.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is used for wood crops and watershed.

This unit is suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 85 cubic feet, or 425 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope. Windthrow is a problem because of the shallowness of the Mariposa soil. Rock outcrop does not appreciably affect the use of this unit. Conventional methods used in tree harvest can be used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the very high erosion hazard. High lead, balloon, or helicopter logging methods are the most efficient because equipment damage to the soil surface is held to a minimum. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants.

This unit provides habitat for black bear, black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

Capability subclass VIIs(22) nonirrigated; Storie index 9.

169—Maymen-Rock outcrop complex, 9 to 50 percent slopes. This rolling to steep soil and Rock outcrop are on mountainous uplands at elevations of 1,200 to 3,500 feet. The unit is about 50 percent Maymen soil and 20 percent Rock outcrop. The average annual precipitation, some of which falls as snow, ranges from 40 to 55 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 225 days. Natural vegetation is brush and scattered stunted conifer and hardwood.

About 25 percent of this unit is included areas of Mariposa gravelly loam, and 5 percent is Josephine loam.

The Maymen is a somewhat excessively drained, shallow gravelly soil that formed in residuum from hard metamorphic rock.

Typically, the surface layer is brown gravelly loam about 2 inches thick. The subsoil is mixed yellowish brown and light yellowish brown gravelly loam. At a depth of 12 inches is hard slate.

Permeability is moderate. The available water capacity is 0.5 to 3.0 inches. The effective rooting depth is 8 to 20 inches. Surface runoff is rapid. The hazard of erosion is medium or high.

Rock outcrop occurs as scattered areas of metamorphic rock. Some are massive areas of up to 5 acres.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is better suited to watershed than other uses because of the slope, the shallowness, and Rock outcrop.

Brushy areas provide browse and escape for black-tailed deer.

The steepness of slope, Rock outcrop, and the depth to hard rock are the major limitations to be considered in road construction. This unit is not suitable for home construction because the soil material is not deep enough for the installation of septic tank absorption fields.

Capability subclass VIIs(22) nonirrigated; Storie index 9.

170—Maymen-Rock outcrop complex, 50 to 75 percent slopes. This very steep soil and Rock outcrop are

on canyon walls at elevations of 1,200 to 3,500 feet. The unit is about 45 percent Maymen soil and 25 percent Rock outcrop. The average annual precipitation, some of which falls as snow, ranges from 40 to 55 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 225 days. Natural vegetation is brush and scattered stunted conifer and hardwood.

About 25 percent of this unit is included areas of Mariposa gravelly loam, and 5 percent is Josephine loam.

The Maymen is a shallow, somewhat excessively drained gravelly soil that formed in residuum from hard metamorphic rock.

Typically, the surface layer is brown gravelly loam about 2 inches thick. The subsoil is mixed yellowish brown and light yellowish brown gravelly loam. At a depth of 12 inches is hard slate.

Permeability is moderate. The available water capacity is 0.5 to 3.0 inches. The effective rooting depth is 8 to 20 inches. Surface runoff is very rapid. The hazard of erosion is very high.

Rock outcrop consists of scattered areas of massive metamorphic rock, ranging from about 200 square feet to areas of up to 5 acres.

Surface runoff is very rapid. There is no hazard of erosion.

This unit is best suited to watershed.

Brushy areas provide browse and escape cover for black-tailed deer.

Capability subclass VIIIs(22) nonirrigated; Storie index 4.

171—McCarthy cobbly sandy loam, 5 to 30 percent slopes. This is a moderately deep, well drained cobbly soil underlain by weathered andesitic conglomerate. It formed in residuum on long, broad volcanic ridges and their side slopes at elevations of 2,000 to 5,300 feet. The average annual precipitation, some of which falls as snow, is about 40 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 130 and 225 days. Natural vegetation is conifer-hardwood forest and brush.

About 20 percent of the acreage is included areas of a soil that is similar to this McCarthy soil but is 40 to 60 inches deep to bedrock, 10 percent is Cohasset cobbly loam, and 5 percent is Iron Mountain cobbly sandy loam. Above 4,500 feet on some north slopes is a soil that is similar to this McCarthy soil but has a mean soil temperature of 45 to 47 degrees F.

Typically, the surface layer of the McCarthy soil is brown cobbly sandy loam about 13 inches thick. The subsoil is strong brown and reddish yellow very cobbly sandy loam. At a depth of about 39 inches is weathered andesitic conglomerate.

Permeability is moderately rapid. The available water capacity is 1.5 to 3.5 inches. The effective rooting depth is 22 to 40 inches. Surface runoff is medium or rapid. The erosion hazard is moderate or high.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture and for apple and pear orchards. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by using permanent cover in the orchards. All cultivation should be across the slope. To avoid compaction, this soil should not be worked when wet. Cobbles and slope make tilling difficult. Sprinklers should be used in irrigating.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 2.0 to 3.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This McCarthy soil is a good soil for ponderosa pine production. It is moderately suited to intensive management and is capable of producing about 105 cubic feet, or 556 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used for tree harvest, but their use may be restricted in winter. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 12 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are suited to this soil.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards.

Homesite construction—primarily vacation homes—is increasing on this McCarthy soil. The major limitations to urban use are the slope and the depth to rock. In locating roads, special care is needed to minimize the height of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope and the depth to rock.

Capability unit IVe-8(22) irrigated and nonirrigated; Storie index 34.

172—McCarthy cobbly sandy loam, 30 to 50 percent slopes. This is a steep, moderately deep, well drained cobbly soil underlain by weathered andesitic conglomerate. It formed in residuum on side slopes of long, broad volcanic ridges at elevations of 2,000 to 5,300 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 130 and 225 days. Natural vegetation is conifer-hardwood forest and brush.

About 20 percent of the acreage is included areas of a soil that is similar to this McCarthy soil but is 40 to 60 inches deep to bedrock, 10 percent is Cohasset cobbly loam, and 10 percent is Iron Mountain cobbly sandy loam. Above 4,500 feet on some north slopes is a soil that is similar to this McCarthy soil but has a mean soil temperature of 45 to 47 degrees. Also included are a few areas where slopes range up to 75 percent.

Typically, the surface layer of this McCarthy soil is brown cobbly sandy loam about 13 inches thick. The subsoil is strong brown and reddish yellow very cobbly sandy loam. At a depth of about 39 inches is weathered andesitic conglomerate.

Permeability is moderately rapid. The available water capacity is 1.5 to 3.5 inches. The effective rooting depth is 22 to 40 inches. Surface runoff is rapid. The hazard of erosion is high.

This soil is used mainly for wood crops.

This soil is well suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 105 cubic feet, or 556 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope. Cobbles do not appreciably affect the use of this soil. Conventional methods used in tree harvest can be used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the high erosion hazard. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 12 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants. Christmas trees can be grown on this soil.

This soil provides good habitat for black bear, black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

The steepness of slope and the depth to rock are the major limitations to be considered in planning home and road construction. Soil slumps can be a hazard to road cuts because of the low strength and the lateral movement of water in winter.

Capability subclass VIe(22) nonirrigated; Storie index 18.

173—Pits and dumps. Pits and dumps are sand and gravel pits, refuse dumps, and rock quarries. All are typically barren. All vary in natural drainage, permeability, erosion hazard, runoff, and available water capacity.

Capability subclass VIIIs(17, 18, 22) nonirrigated; Storie index 0.

174—Ramona sandy loam, 0 to 2 percent slopes. This is a very deep, well drained soil on alluvial bottoms and low terraces at elevations of 75 to 150 feet. It formed in alluvium from predominantly granitic sources. The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 275 days. Natural vegetation is annual grasses, forbs, and scattered valley oak.

About 10 percent of the acreage is included areas of Kilaga loam, and 5 percent is Cometa sandy loam. Also included are small areas of Xerofluvents, occasionally flooded, and a soil along stream channels that is similar to this Ramona soil but has a darker surface layer.

Typically, the surface layer of this Ramona soil is brown sandy loam and light brown loam about 14 inches thick. The subsoil is mixed reddish yellow and yellowish red sandy clay loam about 41 inches thick. The substratum to a depth of 70 inches or more is reddish yellow gravelly sandy loam.

Permeability is moderately slow. The available water capacity is 6.5 to 9.5 inches. The effective rooting depth is 60 inches or more. Surface runoff is slow. The hazard of erosion is slight.

This soil is used mainly for irrigated field crops, irrigated pasture, and deciduous orchards.

An example of a suitable crop rotation is 4 years of alfalfa or pasture, 1 to 2 years of field corn, and then alfalfa or pasture. Green manure crops should be grown in orchards to maintain an adequate level of organic matter and to improve soil tilth and water penetration. Generally, all crops respond to applications of nitrogen, phosphorus, and potassium. Border, furrow, and sprinkler irrigation are suitable, but the kind of irrigation is generally governed by the crop grown.

This soil has good potential as habitat for mourning dove and pheasant. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence

lines, roadsides, and streambanks to provide needed cover and nesting areas.

This soil supports little construction except for farmsteads. The major limitation is the moderately slow permeability of the subsoil. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability of the subsoil.

Capability class I(17) irrigated; capability unit IIIc-1(17) nonirrigated; Storie index 72.

175—Ramona sandy loam, 2 to 9 percent slopes. This is an undulating, very deep, well drained soil on low terraces at elevations of 100 to 200 feet. It occurs as stringers of higher ground on the terraces. It formed in alluvium from predominantly granitic sources. It is mainly in the Lincoln and Roseville areas. The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 275 days. Native vegetation is annual grasses, forbs, and scattered valley oak.

About 10 percent of the acreage is included areas of Cometa sandy loam, 10 percent is Kilaga loam, and 5 percent is San Joaquin sandy loam.

Typically, the surface layer of this Ramona soil is brown sandy loam and light brown loam about 14 inches thick. The subsoil is mixed reddish yellow and yellowish red sandy clay loam about 41 inches thick. The substratum to a depth of 70 inches or more is reddish yellow gravelly sandy loam.

Permeability is moderately slow. The available water capacity is 6.5 to 9.5 inches. The effective rooting depth is 60 inches or more. Surface runoff is slow or medium. The hazard of erosion is slight or moderate.

This soil is used mainly for irrigated pasture, deciduous orchards, and winter grain.

Erosion can be controlled by tilling across the slope and by using cover crops in the orchards in winter. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating. All crops respond to nitrogen and phosphorus.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before seeding. The pasture should be mowed to prevent clumping.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

After a grain crop, the soil is usually fallowed in alternate years to conserve moisture and control weeds. Yields are low to moderate. They can be improved with applications of nitrogen, especially when the nitrogen is applied in both nitrate and ammonia form.

Grain fields and orchards have limited potential as habitat for mourning dove. Irrigated pasture provides habitat for dove and pheasant. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

There is little construction on this soil except for farmsteads. The major limitation is the moderately slow permeability of the subsoil. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability of the subsoil.

Capability units IIe-1(17) irrigated, IIIe-I(17) nonirrigated; Storie index 65.

176—Redding and Corning gravelly loams, 2 to 9 percent slopes. These undulating to rolling soils are on high terraces at elevations of 100 to 240 feet. Both soils have a claypan. The Redding soil has a hardpan under the claypan, and the Corning soil has softly consolidated gravelly alluvium under the claypan. A mapped area can consist of only one of these soils or both. The average annual precipitation is about 22 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses, forbs, and a few scattered oak.

About 5 percent of this unit is included areas of a deep soil that does not have a claypan and supports fair stands of oak trees. Another 5 percent is a soil that is similar to this Redding soil but has a yellowish brown subsoil. Along the contact with the low terraces, there are small areas of Cometa, Fiddyment, and San Joaquin soils.

The Redding is a well drained claypan soil that is moderately deep over a hardpan. It formed in gravelly old valley fill from mixed sources.

Typically, the surface layer is strong brown and yellowish red gravelly loam and reddish brown loam about 14 inches thick. The subsoil is dark reddish brown and reddish brown clay. At a depth of about 28 inches is the hardpan.

Permeability is very slow. The available water capacity is 1.5 to 3.0 inches. The effective rooting depth is 20 to 34 inches. Most roots in the clay subsoil are along the faces of peds, which reduces the water available to plants. Surface runoff is slow or medium. The hazard of erosion is slight or moderate. After intense rainstorms, the soil is saturated for a short time.

The Corning is a well drained, very deep claypan soil that is underlain by gravelly alluvium. It formed in old valley fill from mixed sources.

Typically, the surface layer is reddish brown, yellowish red, and red gravelly loam about 22 iches thick. The subsoil is red and dark red clay about 18 inches thick. The substratum to a depth of 60 inches is strong brown clay loam.

Permeability is very slow. The available water capacity is 4.0 to 6.5 inches. The effective rooting depth is 60 inches or more, but most roots in the clay subsoil are along the faces of peds, which reduces the water available to plants. Surface runoff is slow or medium. The hazard of erosion is slight or moderate. After intense rainstorms, the soil is saturated for a short time.

Most areas are used as annual rangeland. A few areas are used for irrigated pasture and winter grains.

Erosion can be controlled by tilling across the slope. The high content of gravel makes cultivation difficult. To avoid compaction, these soils should not be cultivated or have equipment moved across them when wet. Sprinklers generally should be used in irrigating, but on the flatter slopes, border irrigation can be used.

After a grain crop, these soils are usually fallowed in alternate years to conserve moisture and control weeds. Yields are low but can be improved by applications of nitrogen, especially when the nitrogen is applied in both nitrate and ammonia form.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture consists of narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping. It responds to applications of nitrogen and phosphorus.

Irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. Leveling for border irrigation may expose the dense clay subsoil. The frequency of irrigation is about every 5 to 8 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

This unit has fair potential as rangeland. Most range grasses are low in nutrient content because these soils are low in fertility. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and by applying nitrogen, phosphorus, and sulfur. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

This unit has limited potential as habitat for mourning dove and California quail. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

In the Sheridan area, some of this unit is being converted to rural subdivisions. The major limitations to urban use of the Redding soil are the very slow permeability of the subsoil and substratum, the moderate depth to a hardpan, and the limited ability of the soil to support a load. The major limitations of the Corning soil are the very slow permeability of the subsoil, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwellings and roads can be designed to offset the low bearing strength and the shrink-swell potential. Septic tank absorption fields probably will not function properly on the Redding soil because of the very slow permeability of the subsoil and the underlying hardpan. They will not function on the Corning soil because of the very slow permeability of the subsoil and substratum.

Capability unit IVe-3(17) irrigated and nonirrigated; Storie index Redding 22, Corning 34.

177—Redding and Corning gravelly loams, 9 to 15 percent slopes. These soils occupy prominent mounds and side slopes of high terraces in the Sheridan area. Both soils have a claypan. The Redding soil has a hardpan under the claypan. The Corning soil has gravelly alluvium under the claypan. A mapped area can consist of only one of these soils or both. Elevations are 100 to 240 feet. The average annual precipitation is about 22 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses, forbs, and a few scattered oak.

About 5 percent of this unit is included areas of a deep soil that does not have a claypan and supports fair stands of oak trees. About 5 percent is a soil that is similar to this Redding soil but has a yellowish brown subsoil. Also included are a few small areas where slopes are up to 20 percent.

The Redding is a well drained claypan soil that is moderately deep over a hardpan. It formed in gravelly old valley fill from mixed sources.

Typically, the surface layer is strong brown and yellowish red gravelly loam and reddish brown loam about 14 inches thick. The subsoil is dark reddish brown and reddish brown clay. At a depth of about 28 inches is the hardpan.

Permeability is very slow. The available water capacity is 1.5 to 3.0 inches. The effective rooting depth is 20 to 34 inches. Most roots in the clay subsoil are along the faces of peds, which reduces the water available to plants. Surface runoff is medium. The hazard of erosion is moderate.

The Corning is a very deep, well drained claypan soil that is underlain by gravelly alluvium. It formed in old valley fill from mixed sources.

Typically, the surface layer is reddish brown, yellowish red, and red gravelly loam about 22 inches thick. The subsoil is red and dark red clay about 18 inches thick.

The substratum to a depth of 58 inches is strong brown clay.

Permeability is very slow. The available water capacity is 4.0 to 6.5 inches. The effective rooting depth is 60 inches or more, but most roots in the clay subsoil are on the faces of peds, which reduces the water available to plants. Surface runoff is medium. The hazard of erosion is moderate.

These soils are used mainly as annual rangeland.

Most range grasses are low in nutrient content because the soils are low in fertility level. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and by applying nitrogen, phosphorus, and sulfur. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be planned so that desirable vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

These soils have limited potential as habitat for mourning dove and California quail. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

There is little rural development. The major limitations to urban use are the very slow permeability in the subsoil of both soils and the hardpan under the Redding soil. These limitations restrict the proper functioning of septic tank absorption fields.

Capability unit IVe-3(17) nonirrigated; Storie index Redding 19, Corning 30.

178—Riverwash. Riverwash occurs in and along channels of the Bear and American Rivers. The material is highly stratified stony and bouldery sand that is typically barren. It is inundated yearly by floodwater. About 50 percent of it is covered with water. Riverwash is subject to scouring or cutting as well as to deposition, depending on riverflow and bedload. Included are areas of tailings.

Permeability is very rapid. The available water capacity and drainage are variable. Surface runoff is rapid. The hazard of erosion is very high.

Riverwash is used for watershed. It also provides good habitat for wildlife.

Capability subclass VIIIw(17, 18, 22); Storie index 0.

179—Rock outcrop. Rock outcrop is exposed highly resistant metamorphic rock, andesitic rock, serpentine rock, or syenite rock formations. The rock crops out mainly on steep to very steep slopes that break into the major drainageways. At the lower elevations, it is generally associated with Auburn soils. At higher elevations, it is associated with the Boomer variant, Dubakella, Mariposa, and Maymen soils. These areas are essentially barren. The only plant cover is sparse grasses and browse and stunted trees.

From 50 to 90 percent of the surface is Rock outcrop and stone. The rest is a thin mantle of soil material. Drainage is excessive. Surface runoff is very rapid. There is little or no hazard of erosion.

This unit is used for watershed. In some areas of serpentine rock, there are chromium deposits.

Capability subclass VIIIs(18, 22) nonirrigated; Storie index less than 5.

180—Rubble land. Rubble land is cobbly and stony mine debris and tailings from dredge or hydraulic mining. It is essentially barren. Grasses and brush are sparse. At higher elevations, noncommercial stands of conifer are regenerating.

Nearly all soil material either has been washed away as in hydraulic mining, or has been buried, as in dredge mining. Surface runoff and the hazard of erosion are variable.

Rubble land is used mainly for watershed. It also provides some habitat for wildlife. Some areas are a source of aggregate.

Capability subclass VIIIs(18, 22) nonirrigated; Storie index less than 5.

181—San Joaquin sandy loam, 1 to 5 percent slopes. This is a well drained claypan soil that is moderately deep over a hardpan. It is on low terraces at elevations of 50 to 200 feet. It formed in alluvium from predominantly granitic sources. The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses and forbs.

About 15 percent of the acreage is included areas of Cometa sandy loam, 5 percent is Fiddyment loam, and 5 percent is a soil that is similar to this San Joaquin soil but is less than 20 inches deep over a hardpan. Also included are small areas of Ramona sandy loam or Kilaga loam on scattered narrow ridges and areas of Alamo clay in some drainageways and basins.

Typically, the surface layer of this San Joaquin soil is reddish yellow sandy loam about 15 inches thick. The subsoil is reddish yellow clay loam and yellowish red clay. At a depth of about 35 inches is the hardpan.

Permeability is very slow. The available water capacity is 2.0 to 3.5 inches. The effective rooting depth is 20 to 35 inches. The dense clay subsoil restricts most roots and reduces the available moisture. Surface runoff is slow. The hazard of erosion is slight. After intense rainstorms, the soil is saturated for a short time.

Most areas are used for winter grain. When grain prices are down, much of the grainland is used as annual range. A few areas are used for irrigated pasture and rice.

To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet, except in growing rice. Flood, border, or sprinkler irrigation is suit-

able. After a grain crop, this soil is usually fallowed in alternate years to conserve moisture and control weeds. Yields are low but can be improved by applications of nitrogen, especially when it is applied in both nitrate and ammonia form.

Irrigated pasture should consist of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping. It responds to applications of nitrogen and phosphorus. Leveling for border irrigation may expose the hardpan. The frequency of irrigation is about every 5 to 8 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

Flatter areas are well suited to rice. The soil needs to be leveled so that water can be ponded. The hardpan under this soil is nearly impervious to the downward movement of water. Water requirements for rice are about 1 cubic foot per second for 40 acres after the checks are flooded. Rice should be rotated with barley every 2 to 4 years to help control aquatic weeds and soil fungus.

This soil has fair potential for rangeland. Most rangeland is in poor condition because the forage is volunteer grasses, legumes, and forbs. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch and by applying nitrogen, phosphorus, and sulfur. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

Grainfields and rangeland have limited potential as habitat for mourning dove. Irrigated pasture and ricefields provide habitat for dove and pheasant. Ricefields provide good habitat for duck. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

Some areas of this soil are used for rural subdivisions. The major limitations to urban use are the very slow permeability of the subsoil, the shrink-swell potential of the subsoil, the moderate depth to the hardpan, and the limited ability of the soil to support a load. Dwellings can be designed to offset the low bearing strength, the shrink-swell potential, and the moderate depth to the hardpan. Septic tank absorption fields may not function properly because of the very slowly permeable subsoil and the depth to hardpan, which is generally less than 35 inches.

Capability unit IVe-3(17) irrigated and nonirrigated; Storie index 31.

182—San Joaquin-Cometa sandy loams, 1 to 5 percent slopes. These undulating soils are on low terraces at elevations of 50 to 200 feet. The unit is about 40 percent San Joaquin soil and 30 percent Cometa soil. Both soils have a claypan. The San Joaquin soil has a hardpan under the claypan. The Cometa soil has compacted alluvium under the claypan. The average annual precipitation is about 20 inches. The average annual air temperature is about 62 degrees F. The average frost-free season is about 270 days. Natural vegetation is annual grasses and forbs.

About 10 percent of this unit is included areas of Fiddyment loam, 5 percent is Kaseberg loam, 10 percent is Ramona sandy loam and Kilaga loam on scattered knolls, and 5 percent is Alamo clay in some drainageways and basins.

The San Joaquin is a well drained claypan soil that is moderately deep over a hardpan. It formed in alluvium from predominantly granitic sources.

Typically, the surface layer is reddish yellow sandy loam about 15 inches thick. The subsoil is reddish yellow clay loam and yellowish red clay. At a depth of about 35 inches is the hardpan.

Permeability is very slow. The available water capacity is 2.0 to 3.5 inches. The effective rooting depth is 20 to 35 inches. The dense clay subsoil restricts most roots and thus reduces the water available to plants. Surface runoff is slow. The hazard of erosion is slight. After intense rainstorms, the soil is saturated for a short time.

The Cometa is a deep, well drained claypan soil. It formed in alluvium, mainly from granitic sources.

Typically, the surface layer is brown sandy loam about 18 inches thick. The subsoil is brown clay. At a depth of about 29 inches is very pale brown sandy loam that is slightly compacted.

Permeability is very slow. The available water capacity is 5.0 to 6.5 inches. The effective rooting depth is 60 inches or more, but most roots in the clay subsoil are along the faces of peds, which reduces the water available to plants. Surface runoff is slow. The hazard of erosion is slight. After intense rainstorms, the soil is saturated for a short time.

Most areas are used for winter grain. A few areas are used for irrigated pasture and rice. Sometimes much of the grainland is used as annual rangeland.

To avoid compaction, this unit should not be cultivated or have equipment moved across it when wet, except in growing rice. Flood, border, or sprinkler irrigation is suitable. After a grain crop, these soils are usually fallowed in alternate years to conserve moisture and control weeds. Yields are low but can be improved by applications of nitrogen, especially when it is applied in both nitrate and ammonia form.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting.

The pasture should be mowed to prevent clumping. It responds to applications of nitrogen and phosphorus. Leveling for border irrigation on the San Joaquin soil may expose areas of dense clay or the hardpan. Leveling the Cometa soil may expose areas of the dense clay subsoil. The frequency of irrigation is about every 5 to 8 days during July and August. Approximately 4 to 4 1/2 acre-feet of water is used annually.

Flatter areas are well suited to rice. The soil should be leveled so that water can be ponded. The hardpan under the San Joaquin soil and the clay subsoil and substratum of the Cometa soil are nearly impervious to the downward movement of water. Water requirements for rice are about 1 cubic foot per second for 40 acres after the checks are flooded. Rice should be rotated with barley every 2 to 4 years to help control aquatic weeds and soil fungus.

This unit has fair potential as rangeland. Most of the rangeland is in poor condition because the forage is volunteer grasses, legumes, and forbs. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and by applying nitrogen, phosphorus, and sulfur. In a favorable year, the green feed period is from about March 15 to June 1. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry.

Grainfields and rangeland have limited potential as habitat for mourning dove. Irrigated pasture and ricefields provide habitat for doves and pheasant. Ricefields provide good habitat for ducks. The lack of shrub cover is the major limitation to wildlife habitat. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas.

Some rural development is beginning on this unit. The major limitations to construction on the Cometa soil are the very slow permeability of the subsoil, the shrink-swell potential, and the limited ability of the soil to support a load. The major limitations to construction on the San Joaquin soil are the very slow permeability of the subsoil, the moderate depth to the hardpan, the shrink-swell potential, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset the shrink-swell potential and the low bearing strength of the soils. Community sewage systems must be anticipated in rural subdivisions. Septic tank absorption fields may not function properly because of the very slow permeability in the subsoil of both soils, the substratum of the Cometa soil, and the hardpan under the San Joaquin soil.

Capability unit IVe-3(17) irrigated and nonirrigated; Storie index 34.

183—Sierra sandy loam, 2 to 9 percent slopes. This is a deep, gently rolling, well drained soil underlain by weathered granitic rock. It formed in residuum on low foothills at elevations of 200 to 1,000 feet. It occurs as scattered areas throughout the Loomis Basin. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 15 percent of the acreage is included areas of Andregg coarse sandy loam, 5 percent is a soil that is similar to this Sierra soil but is 20 to 40 inches deep to weathered rock, and 5 percent is another soil that is similar to this Sierra soil but has a light yellowish brown and brown sandy clay loam subsoil. In some swales there is dark colored, poorly drained soil. Near Folsom Lake, there are small areas where this Sierra soil has a thin gravel mantle from old valley fill. About 2 percent of the acreage is scattered rock outcrop.

Typically, the surface layer of this Sierra soil is dark grayish brown, brown, and yellowish red sandy loam about 23 inches thick. The subsoil is yellowish red sandy clay loam and red clay loam. At a depth of 41 inches is highly weathered granodiorite.

Permeability is moderately slow. The available water capacity is 5.0 to 9.5 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium. The hazard of erosion is moderate.

This soil is used mainly for irrigated pasture and deciduous orchards. Small, scattered areas are used as rangeland. Many areas in orchards are now being subdivided and used for rural or ranchette housing.

Erosion can be controlled by tilling across the slope and by using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 8 to 12 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential as rangeland. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and improved perennial dryland grasses, such as Perlagrass. They should be planted in a well prepared seedbed. In a favorable year, the green feed period is from about March 15 to June 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage production.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip plantings of grain provide food. Deer present serious depredation problems in orchards.

There is increasing use of this soil for rural subdivisions. The major limitations to urban use are the moderately slow permeability of the subsoil, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the moderately slow permeability in the subsoil.

Capability unit IIIe-1(18) irrigated and nonirrigated; Storie index 62.

184—Sierra sandy loam, 9 to 15 percent slopes. This is a deep, rolling, well drained soil underlain by weathered granitic rock. It formed in residuum on low foothills at elevations of 200 to 1,000 feet. It occurs as scattered areas throughout the Loomis Basin. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 15 percent of the acreage is included areas of Andregg coarse sandy loam, 5 percent is a soil that is similar to this Sierra soil but is 20 to 40 inches deep to weathered rock, 5 percent is another soil that is similar to this Sierra soil but has a light yellowish brown and brown sandy clay loam subsoil, and 2 percent is scattered rock outcrop.

Typically, the surface layer of this Sierra soil is dark grayish brown, brown, and yellowish red sandy loam about 23 inches thick. The subsoil is yellowish red sandy clay loam and red clay loam. At a depth of 41 inches is highly weathered granodiorite.

Permeability is moderately slow. The available water capacity is 5.0 to 9.5 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium. The hazard of erosion is high.

This soil is used mainly for irrigated pasture and deciduous orchards. Small, scattered areas are used as rangeland. Many areas in orchards are now being subdivided and used for rural or ranchette housing.

Erosion can be controlled by cultivating across the slope. Cover crops should be used in winter. To avoid compaction, this soil should not be cultivated or have equipment moved across it when it is wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 8 to 12 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential as rangeland. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and

improved perennial dryland grasses, such as Perlagrass. They should be planted in a well prepared seedbed. In a favorable year, the green feed period is from March 15 to June 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip plantings of grain provide food. Deer present serious depredation problems in orchards.

There is increasing use of this soil for rural subdivisions. The major limitations to urban use are the moderately slow permeability in the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the moderately slow permeability in the subsoil.

Capability unit IVe-1(18) irrigated and nonirrigated; Storie index 55.

185—Sierra sandy loam, 15 to 30 percent slopes. This is a deep, hilly, well drained soil underlain by weathered granitic rock. It formed in residuum at elevations of 200 to 1,000 feet. The average annual precipitation ranges from about 22 to 33 inches. The average annual air temperature is about 61 degrees F. The average frost-free season is between 250 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 15 percent of the acreage is included areas of Andregg coarse sandy loam, 5 percent is a soil that is similar to this Sierra soil but is 20 to 40 inches deep to weathered rock, 5 percent is another soil that is similar to this Sierra soil but has a light yellowish brown and brown sandy clay loam subsoil, 5 percent is Caperton coarse sandy loam, and 3 percent is scattered rock outcrop.

Typically, the surface layer of this Sierra soil is dark grayish brown, brown, and yellowish red sandy loam about 23 inches thick. The subsoil is yellowish red sandy clay loam and red clay loam. At a depth of 41 inches is weathered granodiorite.

Permeability is moderately slow. The available water capacity is 5.0 to 9.5 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium to rapid. The hazard of erosion is high.

This soil is used mainly for irrigated pasture. It supports some deciduous orchards. Small, scattered areas are used as rangeland. Many areas are being subdivided for rural or ranchette housing.

Erosion can be controlled by using permanent cover. Orchards should be planted and worked across the slope. This soil should be tilled only to establish improved permanent cover. To avoid compaction, it should not be worked when wet. Sprinklers should be used in irrigating.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed should be inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 8 to 12 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential as rangeland. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and improved perennial dryland grasses, such as Perlagrass, planted in a well prepared seedbed. In a favorable year, the green feed period is from about March 15 to June 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed

cover and nesting areas. Grain provides food. Deer present serious depredation problems in orchards.

There is increasing use of this soil for rural subdivisions The major limitation to urban use is the slope. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Because of the erodibility of this soil and its parent material, all cuts and fills should be on at least a 2 to 1 slope. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because of the slope and the moderately slow permeability.

Capability subclass VIe(18) irrigated and nonirrigated; Storie index 48.

186—Sites loam, 2 to 9 percent slopes. This is a deep, undulating to gently rolling, well drained soil underlain by weathered metamorphic rock It formed in residuum, mainly from metasedimentary and metabasic rock on ridges and foot slopes at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest.

About 15 percent of the acreage is included areas of Josephine loam, 5 percent is Mariposa gravelly loam, and 5 percent is a soil that is similar to this Sites soil but is 30 to 40 inches deep to weathered rock. Also included are scattered areas of rock outcrop.

Typically, the surface layer of this Sites soil is dark reddish brown and reddish brown loam about 16 inches thick. The subsoil is red clay loam and clay. At a depth of about 65 inches is soft schistose rock.

Permeability is moderately slow. The available water capacity is 6.5 to 10.0 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium. The hazard of erosion is slight.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture or for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass and Blando bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Sites soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used for tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip planting of grain provides food. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Sites soil. The major limitations to urban use are the moderately slow permeability in the subsoil, the shrink-swell potential of the subsoil, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability.

Capability unit IIe-1(22) irrigated, and IIIe-1(22) nonirrigated, Storie index 65.

187—Sites loam, 9 to 15 percent slopes. This is a deep, rolling, well drained soil underlain by weathered metamorphic rock. It formed in residuum, mainly from

metasedimentary and metabasic rock, on ridges and foot slopes at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest.

About 10 percent of the acreage is included areas of Josephine loam, 5 percent is Mariposa gravelly loam, 10 percent is a soil that is similar to this Sites soil but is 30 to 40 inches deep to weathered rock, and 2 percent is scattered rock outcrop.

Typically, the surface layer of this Sites soil is dark reddish brown and reddish brown loam about 16 inches thick. The subsoil is red clay loam and clay. At a depth of about 65 inches is soft schistose rock.

Permeability is moderately slow. The available water capacity is 6.5 to 10.0 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is medium. The hazard of erosion is moderate.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture or for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by tilling across the slope and by using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass and Blando bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Sites soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip plantings of grain provide food. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Sites soil. The major limitations to urban use are the moderately slow permeability in the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset most of these limitations. Septic tank absorption fields may not function properly during periods of rain or heavy use because of the moderately slow permeability.

Capability unit IIIe-1(22) irrigated and nonirrigated; Storie index 58.

188—Sites loam, 15 to 30 percent slopes. This is a deep, hilly, well drained soil underlain by weathered metamorphic rock. It formed in residuum, mainly from metasedimentary and metabasic rock, on uplands at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest.

About 10 percent of the acreage is included areas of Josephine loam, 5 percent is Mariposa gravelly loam, 10 percent is a soil that is similar to this Sites soil but is 30 to 40 inches deep to weathered rock, and 2 percent is scattered rock outcrop.

Typically, the surface layer of this Sites soil is dark reddish brown and reddish brown loam about 16 inches thick. The subsoil is red clay loam and clay. At a depth of about 65 inches is soft schistose rock.

Permeability is moderately slow. The available water capacity is 6.5 to 10.0 inches. The effective rooting

depth is 40 to 60 inches or more. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

Most areas are used for wood crops. A few areas where water is available for irrigation are used for irrigated pasture or for apple and pear orchards. Selected varieties of grapes are also grown. The orchards are planted below elevations of 3,500 feet to help reduce crop losses resulting from freezes late in spring. Some areas provide homesites.

Erosion can be controlled by using permanent cover in the orchards. The cultivation needed in establishing permanent cover should be across the slope. Orchards should be planted and worked across the slope. To avoid compaction, this soil should not be worked when wet. The slope makes cultivation difficult. Sprinklers should be used in irrigating.

In pear orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover is low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is broadleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. This pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Apples and pears may need small applications of zinc, magnesium, and boron. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent.

On pasture and in apple and pear orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.5 to 5.5 inches of water is applied at each irrigation. The frequency of irrigation is every 10 to 14 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This Sites soil is one of the best soils in the area for ponderosa pine production. It is suited to highly intensive management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. Conventional methods can be used in tree harvest, but their use may be restricted in winter. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable understory plants. Christmas trees are well suited to this soil. Intensive pruning is needed to reduce excessive growth between whorls.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and band-tailed pigeon. Forested areas provide habitat for black-tailed deer, black bear, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Deer present serious depredation problems in orchards and vineyards.

Homesite construction—primarily vacation homes—is increasing on this Sites soil. The major limitations to urban use are the moderately slow permeability in the subsoil, the shrink-swell potential of the subsoil, the slope, and the limited ability of the soil to support a load. Dwelling and road construction can be designed to offset the shrink-swell potential and the limited ability to support a load. In locating roads, special care is needed to minimize the heights of cuts and fills. Cuts and fills greater than 6 feet make access to building sites a problem. Septic tank absorption fields may not function properly because of the slope and the moderately slow permeability.

Capability unit IVe-1(22) irrigated and nonirrigated; Storie index 51.

189—Sites loam, 30 to 50 percent slopes. This is a deep, steep, well drained soil underlain by weathered metamorphic rock. It formed in residuum, mainly from metasedimentary and metabasic rock, on mountainous uplands at elevations of 2,000 to 4,000 feet. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 56 degrees F. The average frost-free season is between 150 and 250 days. Natural vegetation is conifer-hardwood forest.

About 15 percent of the acreage is included areas of Josephine loam, 10 percent is Mariposa gravelly loam, 10 percent is a soil that is similar to this Sites soil but is 30 to 40 inches deep to weathered rock, and 5 percent is scattered rock outcrop.

Typically the surface layer of this Sites soil is dark reddish brown and reddish brown loam abut 16 inches thick. The subsoil is red clay loam and clay. At a depth of about 65 inches is soft schistose rock.

Permeability is moderately slow. The available water capacity is 6.5 to 10.0 inches. The effective rooting depth is 40 to 60 inches or more. Surface runoff is rapid. The hazard of erosion is high.

Most areas are used for wood crops.

This soil is well suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope. Conventional methods used in tree harvest can be used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the high erosioin hazard. Roads and skid trails should be protect-

ed from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants. Christmas trees can be grown on this soil. Pruning is needed to reduce excessive growth between whorls.

This soil provides good habitat for black bear, black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

Steepness of slope is the major limitation to be considered in planning home and road construction. Soil slumps can be a hazard in road cuts because of the low strength and the lateral movement of water in winter.

Capability subclass VIe(22) nonirrigated; Storie index 29.

190—Sites-Rock outcrop complex, 15 to 50 percent slopes. This hilly to steep soil and Rock outcrop are on mountainous uplands at elevations of 2,000 to 4,000 feet. The unit is about 60 percent Sites soil and 15 percent metamorphic Rock outcrop. The average annual precipitation, some of which falls as snow, ranges from 40 to 60 inches. The average annual air temperature is about 55 degrees F. The average frost-free season is between 150 and 230 days. Natural vegetation is conifer-hardwood forest and brush.

About 15 percent of this unit is included areas of Josephine loam, 5 percent is Mariposa gravelly loam, and 5 percent is a soil that is similar to this Sites soil but is 30 to 40 inches deep to weathered rock.

The Sites is a deep, well drained soil that formed in residuum from metasedimentary rock.

Typically, the surface layer is dark reddish brown and reddish brown loam about 16 inches thick. The subsoil is red clay loam and clay. At a depth of about 65 inches is soft schistose rock.

Permeability is moderately slow. The available water capacity is 6.5 to 10.0 inches. The effective rooting depth is 40 to 60 inches. Surface runoff is medium or rapid. The hazard of erosion is moderate or high.

The Rock outcrop is metamorphic rock about 1 to 10 square feet.

Surface runoff is very rapid. There is no hazard of erosion.

Most areas are used for wood crops.

This unit is well suited to ponderosa pine production. It is suited to moderate management and is capable of producing about 130 cubic feet, or 776 board feet (International rule), per acre annually of merchantable timber from a fully stocked, even-aged stand of 70 years. The major limitation to timber production is the slope. The Rock outcrop does not appreciably affect the use of this unit. Conventional methods used in tree harvest can be used only with difficulty because of the slope. The slope can also be damaging to the soil resource because of the high erosion hazard. Roads and skid trails should be protected from runoff. Grades on unsurfaced roads should be less than 10 percent. Reforestation after harvest must be managed to reduce competition from undesirable plants. Christmas trees can be grown on this unit. Pruning is needed to reduce excessive growth between whorls.

This unit provides good habitat for black-tailed deer, band-tailed pigeon, wild turkey, and gray squirrel.

Steepness of slope and the Rock outcrop are the major limitations to be considered in planning home and road construction. Soil slumps can be a hazard in road cuts because of the low strength and the lateral movement of water in winter.

Capability subclass VIs(22) nonirrigated; Storie index 36.

191—Sobrante silt loam, 2 to 15 percent slopes. This is a moderately deep, undulating to rolling, well drained soil underlain by weathered metabasic rock. It formed in residuum on foothills at elevations of 600 to 1,500 feet. Most slopes are plane or slightly concave. The average annual precipitation ranges from 25 to 35 inches. The average annual air temperature is about 60 degrees F. The average frost-free season is between 230 and 270 days. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

About 5 percent of the acreage is included areas of Argonaut loam, 5 percent is Auburn silt loam, and 5 percent is a soil that is similar to this Sobrante soil but is 40 to 55 inches deep to weathered rock.

Typically, the surface layer of this Sobrante soil is yellowish red silt loam about 7 inches thick. The subsoil is yellowish red silt loam and heavy loam. At a depth of about 33 inches is highly weathered basic schist. At about 40 inches is hard unweathered schist.

Permeability is moderate. The available water capacity is 3.0 to 7.0 inches. The effective rooting depth is 22 to 40 inches. Surface runoff is medium. The hazard of erosion is slight or moderate.

Most areas are used for deciduous orchards and irrigated pasture. Some areas are used as rangeland. A few are being urbanized.

Erosion can be controlled by tilling across the slope and using cover crops in orchards in winter. Cultivation should be limited to the control of weeds. To avoid compaction, this soil should not be cultivated or have equipment moved across it when wet. Sprinklers should be used in irrigating.

Wimmera 62 ryegrass, Blando bromegrass, or Cucamonga bromegrass provide a satisfactory cover crop in orchards. The annual cover should set seed before it is disked or mowed.

In deciduous orchards, a permanent cover crop can be annual grasses and weeds, which are mowed. A perennial permanent sod cover should consist of low growing legumes and perennial grasses, such as white Dutch clover, Salina strawberry clover, and Pomar orchardgrass. It should be mowed in spring and summer through

fruit harvest. No legumes should be used in a cover crop in apple orchards.

Irrigated pasture can be a combination of legumes and grasses planted in a well prepared seedbed. A typical seed mixture is narrowleaf trefoil and Akaroa orchardgrass. The legume seed is inoculated before planting. The pasture should be mowed to prevent clumping.

All crops respond to applications of nitrogen and phosphorus. Potassium is usually adequate. Orchards may need small applications of zinc. In orchards under permanent cover, fertilizer rates are generally increased by about 50 percent. Range legumes respond to applications of sulfur.

On pasture and in deciduous orchards, irrigation water is applied by sprinklers at a rate of 0.25 to 0.35 inch per hour. A total of 3.0 to 4.5 inches of water is applied at each irrigation. The frequency of irrigation is every 6 to 10 days during July and August. Approximately 3 1/2 acre-feet of water is used annually.

This soil has good potential as rangeland. Forage production can be increased by introducing improved annuals, such as Blando bromegrass and Lana vetch, and improved perennial dryland grasses, such as Perlagrass, planted in a well prepared seedbed. In a favorable year, the green feed period is from about March 15 to June 15. Grazing should be planned so that desirable vegetation, such as soft chess, wild oats, and filaree, is maintained and enough vegetation is left to protect the soil from depletion and erosion. Range plants should be grazed only when the soil is dry. Oak thickets can be thinned to increase forage.

Orchard and pasture areas have good potential as habitat for California quail, mourning dove, and pheasant. Wooded areas provide habitat for black-tailed deer, gray squirrel, and wild turkey. To encourage wildlife populations, shrub hedgerows can be established along fence lines, roadsides, and streambanks to provide needed cover and nesting areas. Protective strip plantings of grain provide food. Deer present serious depredation problems in orchards.

This soil is used increasingly as sites for rural subdivisions. The major limitation to urban use is the depth to rock. Community sewage systems must be anticipated in medium and high density subdivisions. Septic tank absorption fields may not function properly because the depth to rock is generally less than 40 inches.

Capability unit IIIe-8(18) irrigated and nonirrigated; Storie index 61.

192—Xerofluvents, sandy. Xerofluvents, sandy, consist of small areas of moderately well drained, stratified sandy alluvium adjacent to the Bear River near Sheridan. Included is a small area below Halsey Forbay consisting of sandy alluvium deposited from cleaning the Forbay. Natural vegetation is annual grasses, forbs, cottonwood, and willow.

These are variable brown and grayish brown, stratified sands and loamy sands. The subsoil has thin lenses of silt and loam.

Permeability is moderately rapid or rapid. The available water capacity is 3 to 5 inches. The effective rooting depth is 60 or more inches. Surface runoff is slow. The hazard of erosion is slight. A water table rises in winter but drops below 60 inches late in spring. These soils are occasionally flooded by stream overflow.

Where protected by levees along the Bear River, these soils are used for row crops and deciduous orchards. Green manure crops should be grown to maintain the level of organic matter and to improve soil tilth and water penetration. Generally all crops respond to applications of nitrogen, phosphorus, and potassium. Furrows and sprinklers are suitable for irrigation.

Undeveloped areas have good potential as cover and nesting habitat for mourning dove and pheasant.

Xerofluvents, sandy, are not suited to urban use because of the flood hazard.

Capability unit IIIs-2(17) irrigated and nonirrigated; Storie index 43.

193—Xerofluvents, occasionally flooded. Xerofluvents, occasionally flooded, consist of small areas of moderately well drained loamy alluvium adjacent to stream channels. Natural vegetation is annual grasses, forbs, and valley oak.

These are variable colored, stratified sandy loams, loams, silt loams, and clay loams that generally become gravelly with increasing depth. The depth to underlying restrictive material is greater than 60 inches.

Permeability is moderate to moderately slow. The available water capacity is 8 to 10 inches. The effective rooting depth is greater than 60 inches. Surface runoff is slow. The hazard of erosion is slight. The water table rises to within 30 to 48 inches of the surface during the rainy season but drops below 60 inches late in spring. Some areas near the Sutter County line are somewhat poorly drained as a result of the irrigation of adjacent land. These soils are occasionally flooded by stream overflow.

Where protected by levees along the Bear River, these soils are used for row crops and deciduous orchards. Much of the acreage that occurs as long, narrow stringers along minor streams is used with adjacent soils. Generally all crops respond to applications of nitrogen, phosphorus, and potassium. Borders, furrows, and sprinklers are suitable for irrigation. The kind of irrigation, however, is generally governed by the crop grown.

Undeveloped areas adjacent to streams have good potential as cover and nesting habitat for mourning dove and pheasant.

These soils are not suited to urban use because of the flood hazard.

Capability unit IIw-2(17, 18) irrigated and nonirrigated; Storie index 69.

194—Xerofluvents, frequently flooded. Xerofluvents, frequently flooded, consist of narrow stringers of somewhat poorly drained recent alluvium adjacent to stream channels. Natural vegetation is annual grasses, forbs, sedges, valley oak, and willow.

These are variable colored, stratified gravelly sandy loams, gravelly loams, and gravelly clay loams that generally grade to sand and gravel with increasing depth. The depth to underlying restrictive material is greater than 36 inches.

Permeability is variable. The available water capacity is 2.5 to 6 inches. The effective rooting depth is greater than 36 inches. Surface runoff is slow. The hazard of erosion is high. Areas are subject to frequent flooding and channelization.

Because of the frequent flooding, most of the acreage is idle. Some of the acreage is pasture. A plant cover is needed in winter to protect these soils from erosion and channelization during periods of flooding.

Idle areas have good potential as cover and nesting habitat for wildlife.

These Xerofluvents are not suited to urban use because of the flood hazard.

Capability unit IVw-2(17, 18, 22) irrigated and nonirrigated; Storie index 36.

195—Xerofluvents, hardpan substratum. Xerofluvents, hardpan substratum, consist of small areas of somewhat poorly drained loamy alluvium in minor drainageways on terraces. Natural vegetation is annual grasses, forbs, and sedges.

These are variable colored, stratified loams and clay loams. Depth to the underlying hardpan ranges from 20 to 36 inches. About 20 percent of the area is Alamo clay.

Permeability is moderately slow. The available water capacity is 2.5 to 5 inches. The effective rooting depth is 20 to 36 inches. Surface runoff is slow. The hazard of erosion is slight. The water table rises to within 20 inches of the surface in winter, but disappears late in spring. These soils are occasionally flooded by stream overflow.

The use of these soils generally is the same as that of adjacent soils. Most areas are cultivated. Crops commonly grown are winter grain, irrigated pasture, and rice. A protective strip of vegetation left on each side of the channel can prevent the meandering of stream channels through areas of these soils.

Capability unit IIIw-2(17) irrigated and nonirrigated; Storie index 47.

196—Xerorthents, cut and fill areas. Xerorthents, cut and fill areas, consist of mechanically removed and mixed soil material in which horizons are no longer discernible. Most of this material is in the right-of-way of Interstate 80, the town of Auburn, and the Southern Pacific trainyard in Roseville. Some fill areas contain rocks, concrete, asphalt, and other debris. Included are small areas of similar soils.

Cut and fill areas are typically well drained. Surface runoff is very rapid. The hazard of erosion is moderate. Permeability and available water capacity are variable.

These cut and fill areas are used primarily for highways and urban development.

Capability subclass VIIIs(17, 18, 22) nonirrigated; Storie index less than 10.

197—Xerorthents, placer areas. Xerorthents, placer areas, consist of stony, cobbly, and gravelly material commonly adjacent to streams that have been placer mined. Natural vegetation varies but generally is annual grasses, browse, oak, alder, willow, and cottonwood.

The soil material is derived from a mixture of rocks. It is stratified or poorly sorted. It contains enough fine sand and silt to support some grass. Depth of soil material ranges from 6 inches to more than 5 feet. Permeability, available water capacity, runoff, erosion hazard, and drainage are variable. Areas in streambeds are frequently flooded during the rainy season.

These soils have some value for grazing and for watering livestock. They also provide a good cover and water for wildlife.

Capability subclass VIIs(17, 18, 22) nonirrigated; Storie index less than 5.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil

properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

More than 62,000 acres in the survey area was used for crops and pasture in 1974, according to the Placer County Agricultural Commissioner's Report. Of this total 27,000 acres was irrigated pasture; 1,000 acres row crops, mainly corn; 14,000 acres close-grown crops, mainly wheat and oats; 5,000 acres rotation hay and pasture; 9,000 acres rice; 500 acres seed crops; and 5,000 acres fruit and nut crops, mainly pears and plums.

The soils in Placer County have good potential for increased production of food. About 20,000 acres of potentially good cropland is currently used as woodland and about 80,000 acres as pasture. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

Acreage in crops and pasture has gradually been decreasing as more and more land is used for urban development. It was estimated that in 1967 the county had about 36,000 acres of urban and built-up land; this acreage has been growing at the rate of about 200 acres per year. The use of this soil survey to help make land use decisions that will influence the future role of farming in the county is discussed in the section "General soil map for broad land use planning."

Erosion control provides a protective surface cover, reduces runoff, and increases infiltration. A cropping system that keeps a plant cover on the soil for extended periods during the rainy season can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land and also provide nitrogen and improve tilth for the following crop.

Information for the design of erosion control practices for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 2. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 2.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum

levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown; that good quality irrigation water is uniformly applied in proper amounts as needed; and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 2 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability unit is identified in the description of each soil mapping unit in the section "Soil maps for detailed planning." Capability units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The numerals designating units within the subclasses indicate—

0.—A limitation caused by stony, cobbly, or gravelly material in the substratum.

1.—A limitation caused by slope or by actual or potential erosion hazard.

2.—A limitation of wetness caused by poor drainage or flooding.

3.—A limitation of slow or very slow permeability of the subsoil or substratum caused by a clayey subsoil or a substratum that is semiconsolidated.

4.—A limitation caused by sandy or gravelly soils with a low available water capacity.

5.—A limitation caused by a fine-textured or very fine-textured surface layer.

6.—A limitation caused by salt or alkali.

7.—A limitation caused by rocks, stones, or cobblestones.

8.—A limitation in the root zone, which generally is less than 40 inches over massive bedrock and lacks moisture for plants.

9.—A limitation caused by low or very low fertility, by acidity, or by toxicity that cannot be corrected by adding normal amounts of fertilizer, lime, or other amendments.

Land resource areas

Placer County, Western Part has been divided into 3 land resource areas, based on soils, climate, topography, vegetation, and use. These resource areas are designated nationally as 17, 18, and 22. In the survey area, land resource area 17 consists of the terraces of the Sacramento Valley; 18, the grass-oak foothills of the Sierra Nevadas; and 22, the forested mountainous uplands of the Sierra Nevadas.

Soils in two or more resource areas may be similar and have the same capability unit symbol but management needs differ. These management differences result from differences in climate, vegetation, and the kinds of crops that can be grown. For this reason, capability unit symbols are followed by the numbers (17), (18), and (22) to identify the several resource areas. For example, IVe-8(17), IVe-8(18), and IVe-8(22) all include well drained soils that are shallow to bedrock or a hardpan. Unit IVe-8(17) is in the irrigated valley, unit IVe-8(18) is in the oak-grass covered foothills, and IVe-8(22) is in the conifer-forested mountains.

Land resource area 17 is on terraces in the eastern part of the Sacramento Valley. Vegetation is dominantly grass and scattered oak. Slopes are undulating to rolling. Elevations are 50 to 250 feet. Rainfall is 18 to 23 inches. In this resource area, irrigation water is available, or a source is being developed for most soils suitable for irrigation. The frost-free season is 260 to 285 days. Grazing and grain are the main farm uses. As irrigation water is developed, more soils are being used for pasture, field crops, and rice.

Land resource area 18 is the foothills of the Sierra Nevada Range. Vegetation is generally oak-grass. The area is rolling to steep and is dissected by rivers and streams that flow southwestward. Slopes are steep at the higher elevations, but they gradually level off as they merge with the terraces in the Sacramento Valley. Elevations are 200 to 1,600 feet. Rainfall is 18 to 36 inches. The frost-free season is 230 to 270 days. Grazing is the most common use. Where irrigation has been developed, this land is used for deciduous orchards and pasture.

Land resource area 22 is the mountainous uplands of the Sierra Nevada Range. Vegetation is coniferous forest and associated hardwood. The area is characterized by hilly to steep slopes, deep V-shaped canyons, and some narrow valleys. Ridges on volcanic material are generally tabular and gently sloping. Elevations are 1,200 to 5,300 feet. Precipitation, some of which falls as snow, is 35 to 60 inches. The frost-free season is 130 to 250 days. Wood crop production is the most common use. Where irrigation water has been developed, suitable soils are used for deciduous orchards.

Storie index

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The soils of this survey area are rated according to the Storie Index (*5,6*). This index expresses numerically the relative degree of suitability of a soil for general intensive agriculture as it exists at the time of evaluation. The rating is based on soil characteristics only and is obtained by evaluating such factors as soil depth, surface texture, subsoil characteristics, drainage, salts and alkali, and relief. Other factors, such as availability of water for irrigation, climate, and distance from markets, that might determine the desirability of growing certain plants in a given locality, are not considered. Therefore, in itself, the index should not be considered as a direct index of land value. Where economic factors are known to the user, however, the Storie Index provides additional objective information for comparisons of land tract value. In this publication, the index rating is given at the end of each soil description.

Four general factors are considered in the index rating. These factors are: (A) the characteristics of the soil profile and soil depth; (B) the texture of the surface soil; (C) the dominant slope of the soil; and (X) other factors more readily subject to management or modification. In this area, the X factors include drainage, flooding, and general nutrient level of the soil. For some soils more than one X factor may be used. Each of the four general factors is evaluated on the basis of 100 percent. A rating of 100 percent expresses the most favorable or ideal condition for general crop production; lower percentage ratings are assigned for conditions that are less favorable. Factor ratings are selected from tables prepared from data and observations that related soil properties, plant growth, and crop yield (*4*). Where ranges of values for these factors exist within a given soil unit, the modal condition for a factor is used in assigning a rating value.

The index rating for a soil is obtained by multiplying the four factors, A, B, C, and X; thus any factor may dominate or control the final rating. For example, a soil such as Aiken loam, 2 to 9 percent slopes, is a very deep soil with a moderately slowly permeable profile. This warrants a rating of 85 percent for factor A. This soil has a friable, workable loam surface texture, warranting a rating of 100 percent for factor B. The smooth, gently to moderately sloping surface of this soil justifies a rating of 90 percent for factor C. The moderate nutrient level justifies a rating of 90 percent for factor X. Multiply-

ing these four factors results in a Storie Index of 69 percent for this soil.

Soil complexes in the survey area, for example, Auburn-Sobrante silt loams, 15 to 30 percent slopes, are rated to reflect the proportion of the dominant soils described as present in the unit, in the same manner that tracts or fields containing several different soil map units can be rated. The latter is done by weighted averaging of the sum of the Storie Index values for the soils present, based on the acreages of the soils in the tract or field. The soils in undifferentiated soil groups, for example, Redding and Corning gravelly loams, 2 to 9 percent slopes, are rated separately. Two index values are given at the end of the map unit description; they relate, respectively, to the two soils indicated in the map unit name.

Ratings for each of the map units in this area are for the dominant soil or soils within the unit as described. They do not take into account smaller inclusions of other kinds of soils or miscellaneous areas.

Soils are placed in grades according to their suitability for general intensive agriculture as shown by their Storie Index ratings. The six grades and their range in index ratings are:

	Index ratings
Grade 1	80 to 100
Grade 2	60 to 80
Grade 3	40 to 60
Grade 4	20 to 40
Grade 5	10 to 20
Grade 6	Less than 10

Soils of grade 1 are excellent or well suited to general intensive agriculture. Grade 2 soils are good and are also well suited to agriculture, although they are not so desirable as soils of grade 1. Grade 3 soils are only fairly well suited; grade 4 soils are poorly suited; and grade 5 soils are very poorly suited. Grade 6 consists of soils and land types that are not suited to agriculture.

Rangeland

About 33 percent of Placer County is range. About 42 percent of the farm income is derived from livestock, both cattle and sheep. Cow-calf-steer enterprises, cow-calf-steer-yearling enterprises, and sheep are prevalent in the western part of the county. The average size of ranches is 200 acres. Some of the larger ranch units range up to 3,000 acres.

On many ranches the forage produced on rangeland is supplemented by irrigated pasture and grazing leases on public lands. In December through March, the grazed forage is often supplemented by hay and protein concentrate. Grazed forage is also often supplemented in the summer after drying, mainly in July through November, with protein supplement. Creep feeding of calves and yearlings to increase their market weight is practiced on some ranches.

Soils strongly influence the natural vegetation. In the western part of the county, most of the soils are shallow loams over a claypan or hardpan. These soils support annual grasses, forbs, and legumes. In much of the eastern part of the county, the soils are shallow loams over rock. These soils support annual grasses, forbs, and legumes and sparse to dense stands of oaks and brush.

Where climate and topography are about the same, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 3 shows, for each kind of soil, the name of the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the expected percentage of each species in the composition of the potential natural plant community. Soils not listed cannot support a natural plant community of predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing, or they are used for other purposes, such as cropland, urbanland, or woodland. The following are explanations of column headings in table 3.

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. For those areas where the relationship between soils and vegetation has been established, range sites can be interpreted directly from the soil map. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction is also important.

Total production refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the amount and distribution of precipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

Characteristic species of grasses, grasslike plants, forbs, and shrubs that make up most of the plant community on each soil are listed by common name. Under *Composition*, the expected proportion of each species is

presented as the percentage, in air-dry weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation produced is not used.

Most of the important range forage plants in Placer County, Western Part, are introduced. The original forage plants were a mixture of perennials and annuals. The introduced plants are mostly cool-season annuals. These annuals take advantage of soil moisture while it is there, produce seed, and mature by the time the moisture is gone. They furnish highly nutritious feed in spring when they are green and growing. After maturity, the nutritional value of the grasses declines rapidly. Legumes cure out with higher quality and improve the overall forage quality when present in significant amounts.

Livestock graze selectively. They seek out the more palatable and nutritious plants. If grazing is not carefully regulated, the better, more desirable plants are weakened or eliminated because they are not allowed to produce seed. Less desirable plants then increase. If grazing pressure is continued, the second-choice plants also are thinned out or eliminated, and undesirable, unpalatable plants take their place or the soil is left bare. Proper grazing use is required to sustain rangeland resources.

Experience of ranchers and studies by research workers show that if only part of the current yearly growth of grass is grazed, damage to the more desirable plants is slight and higher production is attained. The vegetation left at the end of the grazing season (1) serves as a mulch that increases the intake rate and storage of water in the soil, (2) protects the soil from water erosion, (3) reduces year-to-year fluctuation in forage production so that healthy plants make more efficient use of soil moisture, (4) holds moisture near the surface after the first rains in fall so that seeds can germinate and get off to an early start, (5) provides a reserve of feed for those years when growing conditions are unfavorable, and (6) insures seed production by desirable species.

In addition to managing the forage so that needed amounts of residue are left, there are range improvement practices that can materially increase production. These practices include tree and brush removal, fertilization, and seeding of suitable grasses and legumes, or a combination of these practices. Sound management requires that grazing use be adjusted from season to season according to the amount of forage produced. Because of the growth habits of annual forage plants, it is very difficult to utilize all the forage when it is most nutritious. Some must be used during dry periods. When the forage is used as dry feed in summer or held for early feed in fall, protein supplements are needed by the livestock unless there is a high percentage of clovers or vetch present. Maintaining adequate reserves of forage permits proper use of vegetation and protection of the soil resources.

A management concern on some of these soils is grazing during the rainy season. Livestock traffic on the clays and gravelly clays results in soil compaction and destruction of vegetation.

The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide additional information about the productivity and management concerns of these range sites.

Woodland management and productivity

Forests are one of the important resources of the survey area. They supply raw material for one of the major industries, provide recreation for many people, provide food and cover for many forms of wildlife, protect watersheds, and form the backdrop for much of the outdoor beauty. Approximately 100,000 acres, or 25 percent of the total area, is capable of supporting commercial forests.

Commercial conifers grow mainly on specific kinds of soils. The most widespread species of commercial conifers is ponderosa pine. Others of commercial importance are sugar pine, white fir, incense-cedar, and Douglas-fir. Digger pine, knobcone pine, and other noncommercial conifers also grow in the area.

Black oak and canyon live oak grow throughout the survey area on soils suited to commercial conifers and often in association with them. Several other noncommercial species of oak grow in the area, including interior live oak, blue oak, and valley oak. Cottonwood, willows, alders, and hardwoods, such as bigleaf maple and Oregon ash, grow along the streams.

Table 4 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Mapping unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, t, d, c, s, f, and r.

In table 4 the soils are also rated for a number of factors to be considered in management. *Slight, moder-*

ate, and *severe* are used to indicate the degree of major soil limitations.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade or grow if openings are made in the tree canopy. The invading plants compete with native plants or planted seedlings by impeding or preventing their growth. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* means that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

The *potential productivity* of merchantable or *important trees* on a soil is expressed as a *site index.* This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 5, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. Examples are corn, wheat, oats, barley, and rice. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Examples are fescue, orchardgrass, Hardinggrass, trefoil, and alfalfa. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are deervetch, wildoats, doveweed, soft chess, and deergrass. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Examples of native plants are oak, poplar, holly-leaf cherry, madrone, alder, dogwood, blackberry, and bearclover. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated good are pyracantha, multiflora rose, toyon, and cotoneaster. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Examples are Digger pine, ponderosa pine, incense cedar, and fir. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Examples are toyon, mountainmahogany, buckbrush, snowberry, and coffeeberry. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Examples of wetland plants are smartweed, wild millet, arrowheads, saltgrass, and nutgrass and rushes, sedges, and reeds. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Examples are marshes, waterfowl feeding areas, and ponds. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include California quail, pheasant, meadowlark, field sparrow, cottontail, and skunk.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, blue grouse, mountain quail, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include black-tailed deer, coyote, red-tailed hawk, meadowlark, and horned lark.

Recreation

The soils of the survey area are rated in table 6 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design. intensive maintenance, limited use, or by a combination of these measures.

The information in table 6 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 8, and interpretations for dwellings without basements and for local roads and streets, given in table 7.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facili-

ties and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 7 shows, for each kind of soil, the degree and kind of limitations for building site development; table 8, for sanitary facilities; and table 10, for water management. Table 9 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 7. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, and open ditches. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 7 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 7 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 8 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seep-

age and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 8 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 9 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 11 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and

have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 9 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 11.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 10 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features.

Engineering properties

Table 11 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 11 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 11 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 11. Also in table 11 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index is estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 12 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and water features

Table 13 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information

about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 13 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Cemented pans are hard subsurface layers, within a depth of 5 or 6 feet, that are strongly compacted (indurated). Such pans cause difficulty in excavation. The hardness of pans is similar to that of bedrock. A rippable pan can be excavated, but a hard pan generally requires blasting.

Risk of corrosion relates to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or the use of more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*9*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 14, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeralf (*Xer*, meaning dry, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Haploxeralfs (*Hapl*, meaning simple horizons, plus *xeralf*, the suborder of Alfisols that have an xeric moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is

thought to typify the great group. An example is Typic Haploxeralfs.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, thermic, Typic Haploxeralfs.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*8*). Unless otherwise noted, colors described are for dry soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or mapping units, of each soil series are described in the section "Soil maps for detailed planning."

Aiken series

The Aiken series consists of very deep, well drained soils underlain by weathered andesitic rock. These soils formed on the tops and sides of volcanic tabular ridges. They are at elevations of 2,000 to 4,000 feet. Slopes are 2 to 30 percent. The average annual precipitation ranges from 40 to 60 inches, some of which falls as snow. The average annual air temperature ranges from 50 to 59 degrees F. Natural vegetation is conifer-hardwood forest.

Similar to Aiken soils are the Cohasset, Horseshoe, and McCarthy soils. Cohasset soils have a cobbly clay loam B horizon. Horseshoe soils have a gravelly clay loam B horizon. McCarthy soils are shallower to bedrock and the B horizon is very cobbly.

Typical pedon of Aiken loam, 2 to 9 percent slopes, 1 mile west of Foresthill, southeast corner SW1/4NW1/4NE1/4 sec. 34. T. 14 N., R. 10 E.

O1-O2—4 inches to 0; litter, leaves, duff, and partly decomposed organic matter.

A11—0 to 7 inches; brown (7.5YR 4/4) loam, dark reddish brown (5YR 3/3) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky, and slightly plastic; many very fine, fine, and medium roots; many very fine interstitial pores; common fine rounded concretions; slightly acid (pH 6.2); clear wavy boundary.

A12—7 to 14 inches; yellowish red (5YR 4/6) loam, dark reddish brown (5YR 3/4) moist; weak medium granular structure; slightly hard, friable, sticky, and slightly plastic; many very fine, fine, and medium and common coarse roots; many very fine interstitial pores; common fine rounded concretions; slightly acid (pH 6.2); clear smooth boundary.

A3—14 to 21 inches; yellowish red (5YR 5/6) loam, dark red (2.5YR 3/6) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky, and slightly plastic; common very fine and medium and few coarse roots; many very fine interstitial and few very fine tubular pores; medium acid (pH 6.0); gradual smooth boundary.

B1t—21 to 30 inches; yellowish red (5YR 5/6) clay loam, dark red (2.5YR 3/6) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky, and plastic; common very fine, fine, medium, and coarse roots; many very fine interstitial and few very fine tubular pores; few thin clay films lining pores; medium acid (pH 6.0); gradual smooth boundary.

B21t—30 to 39 inches; yellowish red (5YR 5/6) heavy clay loam, dark red (2.5YR 3/6) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky, and plastic; common very fine, fine, medium, and coarse roots; many very fine interstitial and few very fine tubular pores; few thin clay films lining pores and as colloid stains on concretions; medium acid (pH 5.7); gradual smooth boundary.

B22t—39 to 48 inches; yellowish red (5YR 5/6) heavy clay loam, dark red (2.5YR 3/6) moist; massive; hard, friable, sticky, and plastic; few fine and coarse roots; common very fine interstitial and few very fine tubular pores; common thin clay films lining pores and few thin colloid stains on mineral grains; strongly acid (pH 5.5); gradual smooth boundary.

B23t—48 to 86 inches; red (2.5YR 4/6) clay, dark reddish brown and dark red (2.5YR 3/4, 3/6) moist; massive; hard, friable, sticky, and plastic; few very fine roots; common very fine interstitial and few very fine tubular pores; common thin clay films lining pores; very strongly acid (pH 4.5).

The depth to weathered andesitic rock ranges from 60 to 94 inches. Cobbles make up to 20 percent of the soil mass. Few to common fine concretions are within a depth of 60 inches.

The A horizon is reddish brown, yellowish red, brown, and dark brown in hue of 5YR and 7.5YR. Thickness ranges from 12 to 22 inches. Reaction is slightly acid or medium acid. The A3 horizon is loam or clay loam.

The B horizon to a depth of about 48 inches is yellowish red or red in hue of 5YR and 2.5YR. Reaction ranges from medium acid to very strongly acid.

Alamo series

The Alamo series consists of deep, poorly drained clay soils underlain by a duripan at 20 to 40 inches. These soils formed in basin areas of terraces. They are at elevations of 50 to 130 feet. Slopes are 0 to 2 percent. The average annual precipitation ranges from 18 to 22 inches. The average annual air temperature is about 62 degrees F. Natural vegetation is annual grasses, forbs, and weeds.

Similar to Alamo soils is the Alamo variant. The Alamo variant soil has a Cca horizon and does not have a duripan.

Typical pedon of Alamo clay from an area of Alamo-Fiddyment complex, 0 to 5 percent slopes, 7 miles southwest of Lincoln, 50 feet north of Pleasant Grove Road, 1,320 feet west and 60 feet north of E1/4 corner sec. 34, T. 12 N., R. 5 E.

Ap—0 to 9 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; common fine and medium strong brown (7.5YR 5/8) mottles; moderate medium angular blocky structure; hard, firm, sticky, and very plastic; common very fine and fine roots; few very fine and fine tubular and interstitial pores; slightly acid (pH 6.1); abrupt smooth boundary.

C1—9 to 27 inches; dark gray (10YR 4/1) clay, very dark grayish brown (2.5Y 3/2) moist; massive; very hard, firm, sticky, and very plastic; few very fine roots; few very fine tubular pores; neutral (pH 7.0); gradual smooth boundary.

C2—27 to 37 inches; dark grayish brown (10YR 4/2) clay, moist and dry; massive; very hard, firm, sticky, and very plastic; few very fine roots; few very fine tubular pores; mildly alkaline (pH 7.8); abrupt smooth boundary.

C3sim—37 inches; light yellowish brown (10YR 6/4) indurated pan; extremely hard, brittle; few fine discontinuous lime coatings; moderately alkaline (pH 8.0).

The depth to indurated siltstone ranges from 20 to 40 inches.

The A horizon is gray, dark gray, and grayish brown in 10YR hue. Thickness ranges from 6 to 10 inches. Reaction is slightly acid or neutral.

The C horizon is dark gray, dark grayish brown, very dark grayish brown, and light brownish gray in hue of 10YR and 2.5Y. Reaction ranges from neutral to moderately alkaline, increasing in pH with depth. In some places carbonates occur as seams below a depth of about 24 inches.

Alamo variant

The Alamo variant consists of deep, somewhat poorly drained soils underlain by unrelated alluvium and weathered volcanic mudstone. These soils formed on bottomlands and footslopes. They are at elevations of 100 to 200 feet. Slopes are 2 to 15 percent. The average annual precipitation ranges from 20 to 25 inches. The average annual air temperature is about 61 degrees F. Natural vegetation is annual grasses and forbs.

Similar to the Alamo variant are Alamo soils. Alamo soils have a duripan but do not have a Cca horizon.

Typical pedon of Alamo Variant clay, 2 to 15 percent slopes, 5.5 miles northeast of Roseville, 2,620 feet northwest of southeast corner sec. 12, T. 11 N., R. 6 E.

O1-O2—1/2 inch to 0; layer of matted roots, decomposing with depth; gradual smooth boundary.

A11—0 to 8 inches; black (N 2/0) clay, black (N2/0) moist; strong medium prismatic structure; very hard, firm, sticky, and very plastic; common fine and very fine roots; common fine tubular pores; slightly acid (pH 6.3); gradual smooth boundary.

A12—8 to 17 inches; very dark gray (N 3/0) clay, very dark gray (N 3/0) moist; strong medium prismatic structure; very hard, firm, sticky, and very plastic; few fine and very fine roots; common fine tubular pores; slightly acid (pH 6.5); gradual smooth boundary.

A13—17 to 25 inches; very dark gray (N 3/0) clay, very dark gray (N 3/0) moist; strong medium prismatic structure; very hard, slightly friable, sticky, and very plastic; few fine and very fine roots; common fine tubular pores; slickensides evident; neutral (pH 6.7); clear smooth boundary.

IIC1ca—25 to 32 inches; variegated very dark grayish brown (2.5Y 3/2) and grayish brown (2.5Y 5/2) sandy clay, very dark grayish brown (2.5Y 3/2) moist; strong medium prismatic structure; very hard, slightly friable, sticky, and very plastic; few fine and very fine roots; common fine tubular pores; slickensides evident; violently effervescent with disseminated lime; mildly alkaline (pH 7.8); abrupt wavy boundary.

IIC2ca—32 to 36 inches; variegated grayish brown (2.5Y 5/2) and very dark grayish brown (2.5Y 3/2) sandy clay, dark grayish brown (2.5Y 4/2) and very dark grayish brown (2.5Y 3/2) moist; massive; hard, friable, sticky, and very plastic; few fine and very fine roots; common fine and very fine tubular and inter-

stitial pores; slickensides evident; violently effervescent with lime disseminated and segregated; moderately alkaline (pH 8.0; abrupt wavy boundary.
IIIC3r—36 inches; weathered volcanic mudstone.

The depth to unrelated alluvial material ranges from 20 to 36 inches. The depth to volcanic mudstone ranges from 36 to 60 inches.

The A horizon is very dark gray or black in 10YR and 2.5Y or neutral hue. Thickness ranges from 20 to 30 inches. Reaction is slightly acid or neutral.

After a dry period, vertical cracks extend throughout the A horizon into the C horizon and slickensides appear in both horizons. The cracks form medium prismatic structure. Some mixing of the A and IIC horizons occurs when clay from the A horizon falls into the cracks.

The IIC horizon is very dark grayish brown and grayish brown in hue of 2.5Y. Reaction is mildly or moderately alkaline. In places the C horizon is calcareous. In places the substratum is shale, siltstone, or other consolidated sediments.

Andregg series

The Andregg series consists of moderately deep, well drained soils underlain by weathered granitic bedrock. These soils formed in upland areas in the Loomis Basin. They are at elevations of 200 to 1,000 feet. Slopes are 2 to 50 percent. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature ranges from 60 to 62 degrees F. Natural vegetation is annual grasses, forbs, blue and live oak and scattered pine.

Similar to Andregg soils are the Caperton and Sierra soils. Caperton soils are less than 20 inches deep. Sierra soils have a sandy clay loam B horizon and hue of 5YR and 2.5YR.

Typical pedon of Andregg coarse sandy loam, 2 to 9 percent slopes, 3 1/2 miles east of Roseville, 80 feet north of Douglas Boulevard, 2,600 feet west and 80 feet north of southeast corner sec. 3, T. 10 N., R. 7 E.

A11—0 to 5 inches; grayish brown (10YR 5/2) coarse sandy loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, very friable, nonsticky, and nonplastic; many very fine and fine roots; many very fine tubular and interstitial pores; 5 percent fine granitic gravel; slightly acid (pH 6.5); clear smooth boundary.
A12—5 to 15 inches; grayish brown (2.5Y 5/2) coarse sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky, and nonplastic; common fine and medium roots; common very fine tubular and interstitial pores and few fine tubular pores; 10 percent fine granitic gravel; medium acid (pH 6.0); clear smooth boundary.
B21—15 to 24 inches; pale brown (10YR 6/3) coarse sandy loam, dark brown (10YR 4/3) moist; massive; hard, very friable, nonsticky and nonplastic; common very fine, medium, and coarse roots; common very fine tubular and interstitial pores and few fine tubular pores; 10 percent fine granitic gravel; neutral (pH 7.0); clear smooth boundary.
B22—24 to 29 inches; very pale brown (10YR 7/3) coarse sandy loam, brown (10YR 5/3) moist; massive; hard, very friable, nonsticky, and nonplastic; few fine and medium horizontal roots; few very fine and fine tubular pores; few thin clay films lining pores and bridging mineral grains; 10 percent fine granitic gravel; slightly acid (pH 6.5); abrupt wavy boundary.
C1r—29 to 37 inches; very pale brown (10YR 7/4) with variegated mineral grains of well weathered granodiorite rock, reddish yellow (7.5YR 6/6) moist; many moderately thick clay films lining pores and bridging mineral grains; 10 percent fine granitic gravel; slightly acid (pH 6.5); gradual wavy boundary.
C2r—37 inches; variegated well weathered granodiorite rock; many moderately thick clay films lining pores and bridging mineral grains; 20 percent fine granitic gravel; slightly acid (pH 6.5).

The depth to weathered granodiorite ranges from 24 to 40 inches.

The A horizon is brown or grayish brown in hue of 10YR and 2.5Y. It is 2 to 10 percent granitic gravel by volume. Thickness ranges from 15 to 20 inches. Reaction is slightly or medium acid.

The B horizon is very pale brown, pale brown, strong brown, reddish yellow, reddish brown, and yellowish brown in hue of 10YR, 7.5YR, and 5YR. Texture is coarse sandy loam, sandy loam, or loam. Reaction ranges from medium acid to neutral.

When crushed and moistened, the C horizon is gravelly coarse sandy loam.

Argonaut series

The Argonaut series consists of moderately deep, well drained soils underlain by metabasic bedrock. These soils formed on broad ridges and in swales on foothills. They are at elevations of 200 to 1,600 feet. Slopes are 2 to 15 percent. The average annual precipitation ranges from 22 to 35 inches. The average annual air temperature ranges from 60 to 62 degrees F. Natural vegetation is annual grasses, forbs, scattered live oak, and a few Digger pine.

Similar to Argonaut soils are the Auburn and Sobrante soils. Auburn and Sobrante soils formed from the same parent material. However, Auburn soils do not have an argillic horizon. Sobrante soils have a fine loamy argillic horizon.

Typical pedon of Argonaut loam from an area of Auburn-Argonaut complex, 2 to 15 percent slopes, on

undulating relief, 7 miles north of Auburn, 1 mile west of Highway 49, in center of NW1/4 sec. 7, T. 13 N., R. 8 E.

A11—0 to 4 inches; strong brown (7.5YR 5/6) loam, dark reddish brown (5YR 3/4) moist; moderate very fine granular structure; slightly hard, friable, slightly sticky, and slightly plastic; many very fine and few fine roots; many very fine tubular and interstitial pores; slightly acid (pH 6.1); clear smooth boundary.
A12—4 to 9 inches; yellowish red (5YR 5/6) silt loam, reddish brown (5YR 4/4) moist; massive; slightly hard, friable, slightly sticky, and slightly plastic; common very fine roots; common very fine tubular pores; slightly acid (pH 6.1); clear smooth boundary.
B1t—9 to 16 inches; yellowish red (5YR 5/6) clay loam, reddish brown (5YR 4/4) moist; massive; hard, friable, sticky, and slightly plastic; few very fine roots; many very fine and few fine tubular pores; few thin clay films lining pores; slightly acid (pH 6.3); abrupt smooth boundary.
B2t—16 to 25 inches; yellowish brown (10YR 5/4) with patches of yellowish red (5YR 5/6) clay, reddish brown (5YR 4/4) moist; massive; very hard, friable, slightly sticky, and plastic; few very fine roots; common fine tubular pores; slightly acid (pH 6.5); abrupt wavy boundary.
Cr—25 inches; weathered basic schist.

The depth to weathered basic schist ranges from 22 to 34 inches.

The A horizon is strong brown or yellowish red in hue of 7.5YR and 5YR. In places it is up to 15 percent angular gravel, cobbles, or larger stones by volume. Reaction is slightly or medium acid. Thickness ranges from 5 to 10 inches.

The B horizon is yellowish brown, reddish brown or yellowish red in hue of 5YR or 10YR. The clay increase between the B1t and the B2t horizons exceeds 30 percent. In some profiles a stone line divides the B1t and the B2t horizons. Reaction is slightly acid or neutral in the B2t horizon. The weathered underlying rock crumbles when disturbed but is firmer with increasing depth, becoming hard rock within 6 to 24 inches.

Auburn series

The Auburn series consists of shallow, well drained soils underlain by metabasic bedrock. These soils formed on foothills. They are at elevations of 200 to 1,600 feet. Slopes are 2 to 70 percent. The average annual precipitation ranges from 22 to 36 inches. The average annual air temperature ranges from 60 to 62 degrees F. Natural vegetation is annual grasses, forbs, oak, and scattered pine.

Similar to Auburn soils are the Argonaut, Exchequer, Inks, and Sobrante soils. Argonaut soils have a clay B horizon. Exchequer soils are less than 20 inches deep. Inks soils have a very cobbly clay loam B horizon and formed from volcanic material. Sobrante soils have a similar A horizon and a heavy loam or clay loam B horizon.

Typical pedon of Auburn silt loam from an area of Auburn-Sobrante silt loams, 15 to 30 percent slopes, 5 miles northwest of Auburn, near center of sec. 35, T. 13 N., R. 7 E.

A1—0 to 4 inches; strong brown (7.5YR 5/6) silt loam, dark reddish brown (5YR 3/3) moist; massive; slightly hard, friable, slightly sticky, and slightly plastic; many very fine roots; many very fine and fine tubular pores; slightly acid (pH 6.4); clear smooth boundary.
B21—4 to 12 inches; yellowish red (5YR 5/6) silt loam, reddish brown (5YR 4/4) moist; massive; hard, friable, slightly sticky, and slightly plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and interstitial pores; slightly acid (pH 6.1); gradual smooth boundary.
B22—12 to 20 inches; yellowish red (5YR 5/6) silt loam, reddish brown (5YR 4/4) moist; massive; hard, friable, slightly sticky, and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine, fine, and medium tubular and interstitial pores; slightly acid (pH 6.5); abrupt wavy boundary.
R—20 inches; partly weathered basic schist.

The depth to bedrock and the thickness of the solum range from 12 to 28 inches. Bedrock and rock fragments regularly interrupt the subsoil. Coarse fragments range from few to 25 percent by volume and consist of gravels, cobbles, and larger stones. Contact with bedrock is abrupt. However, some weathered fracture planes are in some pedons.

The A horizon is strong brown or brown in hue of 7.5YR. In some places slopes of less than 25 percent have common distinct mottles. Thickness ranges from 2 to 12 inches. Reaction is medium or slightly acid.

The B horizon ranges from silt loam to loam and has a 1 to 3 percent clay increase. It is yellowish red or strong brown in hue of 5YR or 7.5YR.

Boomer series

The Boomer series consists of deep, well drained soils underlain by weathered metabasic bedrock. These soils formed on mountainous uplands. They are at elevations of 1,000 to 2,000 feet. Slopes are 2 to 70 percent. At the lower elevations, slopes mainly face north and east; at the higher elevations, slopes face south and west. The average annual precipitation ranges from 30 to 45 inches. The average annual air temperature ranges from 55 to 59 degrees F. Natural vegetation is conifer-hardwood forest and some annual and perennial grasses.

Similar to Boomer soils are the Josephine and Sobrante soils. Josephine soils have an argillic horizon and a base saturation of less than 35 percent. Sobrante soils

are less than 40 inches deep. They have a base saturation of more than 75 percent.

Typical pedon of Boomer loam, 15 to 30 percent slopes, 5 miles north of Auburn, 75 feet south of Virginia Drive, 1,700 feet east and 1,500 feet north of southwest corner sec. 16, T. 13 N., R. 8 E.

O1-O2—1/2 inch to 0; litter, duff, and partly decomposed organic matter.

A11—0 to 2 inches; brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/4) moist; moderate fine granular structure; slightly hard, very friable, nonsticky, and slightly plastic; common very fine and fine roots; many very fine and fine tubular and interstitial pores; 5 percent pebbles; slightly acid (pH 6.5); abrupt smooth boundary.

A12—2 to 10 inches; yellowish red (5YR 5/6) loam, reddish brown (5YR 4/4) moist; weak fine granular structure; slightly hard, friable, slightly sticky, and slightly plastic; many fine roots; many very fine and fine tubular and interstitial pores; 5 percent pebbles; medium acid (pH 5.8); gradual smooth boundary.

B1t—10 to 19 inches; reddish yellow (5YR 6/6) clay loam, red (2.5YR 4/6) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, and slightly plastic; common fine and medium roots; many very fine and fine tubular and interstitial pores; few thin clay films lining pores; 10 percent pebbles; medium acid (pH 6.0); gradual smooth boundary.

B21t—19 to 31 inches; reddish yellow (5YR 6/6) clay loam, red (2.5YR 4/6) moist; weak medium subangular blocky structure; hard, friable, sticky, and slightly plastic; many fine, medium, and coarse roots; many very fine and fine tubular and interstitial pores; few thin clay films lining pores; 10 percent pebbles; medium acid (pH 6.0); gradual smooth boundary.

B22t—31 to 50 inches; reddish yellow (5YR 6/6) gravelly clay loam, red (2.5YR 4/6) moist; moderate medium subangular blocky structure; hard, firm, sticky, and slightly plastic; common fine and medium roots; many very fine and fine tubular and interstitial pores; common thin clay films lining pores and on faces of peds; 20 percent pebbles; medium acid (pH 6.0); clear smooth boundary.

B3t—50 to 58 inches; mixed reddish yellow and yellowish red (5YR 6/6, 5/6) gravelly heavy loam, red and yellowish red (2.5YR 4/6; 5YR 4/6) moist; weak fine subangular blocky structure; hard, friable, slightly sticky, and slightly plastic; few fine and medium roots; many very fine and fine tubular and interstitial pores; few thin clay films lining pores; 35 percent pebbles; medium acid (pH 6.0); clear wavy boundary.

Cr—58 inches; weathered basic schist.

The depth to weathered basic schist ranges from 40 to 60 inches. The profile is 1 to 2 percent cobbles. Pebbles 1 inch or smaller are 5 to 20 percent of the A horizon by volume and 5 to 35 percent of the B horizon. The volume of pebbles increases with depth.

The A horizon is brown, reddish brown, and yellowish red in hue of 7.5YR and 5YR. Texture ranges from loam to gravelly loam. Thickness ranges from 3 to 10 inches. Reaction is slightly or medium acid.

The B2t horizon is yellowish red, reddish yellow, or red in hue of 5YR or 2.5YR. Texture of the upper part is heavy loam or clay loam. The lower part is clay loam or gravelly clay loam.

Boomer variant

The Boomer variant consists of deep, well drained soils underlain by weathered syenite. These soils formed on mountainous uplands. They are at elevations of 1,600 to 2,200 feet. Slopes are 2 to 50 percent. The average annual precipitation ranges from 35 to 45 inches. The average annual air temperature ranges from 55 to 59 degrees F. Natural vegetation is conifer-hardwood forest and scattered brush.

Similar to the Boomer variant are the Boomer, Josephine, and Sites soils. Boomer soils do not have as thick an argillic horizon. Josephine and Sites soils are Ultisols.

Typical pedon of Boomer Variant very stony sandy loam, 15 to 50 percent slopes, about 8 miles north of Auburn, 1,000 feet west and 600 feet north of E1/4 corner sec. 4. T. 13 N., R. 8 E.

O1-O2—1/4 inch to 0; litter, duff, and partly decomposed organic matter.

A11—0 to 4 inches; brown (10YR 5/3) very stony sandy loam, dark brown (7.5YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, nonsticky, and slightly plastic; common very fine roots; many very fine and fine interstitial pores; slightly acid (pH 6.5); abrupt wavy boundary.

A12—4 to 11 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, and slightly plastic; few very fine and many fine and medium roots; common very fine tubular and interstitial pores; medium acid (pH 5.8); clear wavy boundary.

B1t—11 to 19 inches; reddish yellow (7.5YR 6/6) heavy loam, yellowish red (5YR 5/6) moist; weak medium and coarse subangular blocky structure; hard, firm, sticky, and slightly plastic; few very fine and many fine and medium roots; many very fine interstitial pores and common very fine tubular pores; few thin yellowish red (5YR 5/8) clay films lining pores and bridging mineral grains; medium acid (pH 5.6); clear wavy boundary.

B21t—19 to 36 inches; reddish yellow (7.5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; weak medium and coarse angular blocky structure; hard, firm, sticky, and plastic; very few very fine, few fine and common medium roots; few very fine tubular pores; common moderately thick yellowish red (5YR 5/8) clay films on faces of peds and lining pores; medium acid (pH 5.6); clear wavy boundary.

B22t—36 to 54 inches; reddish yellow (7.5YR 6/6) clay, yellowish red and reddish yellow (5YR 5/6, 6/8) moist; weak medium and coarse angular blocky structure; hard, firm, sticky, and plastic; very few very fine and common fine and medium roots; few very fine tubular pores; many thick yellowish red (5YR 5/8) clay films on faces of peds and lining pores; medium acid (pH 6.0); clear wavy boundary.

B23tC1—54 to 60 inches; reddish yellow (7.5YR 6/6) clay, yellowish red and reddish yellow (5YR 5/6, 6/8) moist; weak medium and coarse angular blocky structure; hard, firm, sticky, and slightly plastic; very few medium and coarse roots; common moderately thick clay films on faces of peds and lining pores; 30 percent of this horizon is well weathered parent material; medium acid (pH 6.0); clear wavy boundary.

C2r—60 inches; well weathered nepheline syenite.

The depth to weathered bedrock ranges from 50 to 72 inches.

The A horizon is brown, light brown, or light yellowish brown in hue of 7.5YR and 10YR. It is 5 to 15 percent large gravel and cobbles by volume. Stones cover 0.01 to 3 percent of the surface. Thickness ranges from 8 to 15 inches. Reaction is slightly or medium acid.

The B horizon is brown, strong brown, reddish yellow, or yellowish red in hue of 7.5YR and 5YR. Some pedons have an abrupt clay increase to the Bt horizon. Structure ranges from weak to strong angular blocky in the clay portion. Reaction is medium or strongly acid.

Caperton series

The Caperton series consists of shallow, somewhat excessively drained soils underlain by weathered granitic rock, dominantly quartz diorite. These soils formed in upland areas in the Loomis Basin. They are at elevations of 200 to 1,000 feet. Slopes are 2 to 50 percent. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. Natural vegetation is annual grasses, oak, and some scattered brush or pine.

Similar to Caperton soils are the Andregg, Kaseberg, and Maymen soils. Andregg soils have a B horizon. The depth to strongly weathered granitic rock is more than 24 inches. Kaseberg soils formed on terraces and have an indurated pan. Maymen soils have a lithic contact.

Typical pedon of Caperton gravelly coarse sandy loam, 2 to 30 percent slopes, near the crown of a gently sloping knoll about 5 miles due east of Roseville, 5 feet east of Barton Road, 75 feet south of Olive Branch Road intersection, 75 feet south of northwest corner sec. 2, T. 10 N., R. 7 E.

A11—0 to 6 inches; mixed dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) gravelly coarse sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, nonsticky, and nonplastic; many very fine, fine, and medium roots; many very fine, fine and medium tubular and interstitial pores; 25 percent fine gravel; slightly acid (pH 6.5); clear wavy boundary.

A12—6 to 12 inches; brown (10YR 5/3) gravelly coarse sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, nonsticky, and nonplastic; common fine and medium tubular and interstitial pores; 25 percent fine gravel; slightly acid (pH 6.2); gradual wavy boundary.

C1—12 to 18 inches; pale brown (10YR 6/3) gravelly coarse sandy loam, dark grayish brown (10YR 4/2) and brown (10YR 4/3) moist; massive; hard, friable, nonsticky, and nonplastic; common medium and coarse roots; many very fine, fine and medium tubular and interstitial pores; 30 percent fine gravel; medium acid (pH 6.0); clear wavy boundary.

C2r—18 to 23 inches; pale brown and light yellowish brown (10YR 6/3, 6/4) well weathered quartz diorite crushing to very gravelly coarse sandy loam, strong brown and brown (7.5YR 5/6, 10YR 5/3) moist; massive; very hard, firm, slightly sticky, and nonplastic; few medium and coarse roots; common very fine and fine tubular and interstitial pores; 65 percent fine gravel; medium acid (pH 5.8); clear wavy boundary.

C3r—23 inches; light brown (7.5YR 6/4) well weathered quartz diorite crushing to very gravelly coarse sandy loam; massive; extremely hard, firm, slightly sticky, and nonplastic; many moderately thick red (2.5YR 4/6) clay films lining pores and bridging mineral grains; 65 percent fine gravel; medium acid (pH 5.8).

The depth to strongly weathered granitic material, dominantly quartz diorite, ranges from 8 to 20 inches but is usually from 14 to 20 inches.

The A horizon is dark grayish brown to brown in hue of 10YR and 7.5YR, color value of 4 or 5 dry and 2 or 3 moist, and chroma of 2 or 3 dry or moist. It is 15 to 25 percent pebbles by volume. Texture is gravelly coarse sandy loam or coarse sandy loam. Reaction is slightly or medium acid.

The upper part of the C horizon is brown to light yellowish brown in hue of 10YR and 7.5YR, color value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4 dry or moist. In places iron or clay coatings are 2.5YR. This horizon is 5 to 30 percent pebbles.

The upper part of the Cr horizon has hue of 10YR and 7.5YR and coatings in hue of 5YR and 2.5YR. The lower part to 5 or 6 feet has hue of 7.5YR and 5YR and many coatings in hue of 2.5YR. The Cr horizon is 50 to 70 percent pebbles.

Cohasset series

The Cohasset series consists of deep, well drained soils underlain by andesitic conglomerate. These soils formed on the tops and sides of volcanic tabular ridges. They are at elevations of 2,000 to 4,600 feet. Slopes are 2 to 50 percent. The average annual precipitation ranges from 40 to 60 inches, some of which falls as snow. The average annual air temperature ranges from 50 to 59 degrees F. Natural vegetation is conifer-hardwood forest.

Similar to Cohasset soils are the Aiken, Boomer, Horseshoe, Josephine, and McCarthy soils. Aiken soils have a clay loam B horizon. Boomer soils have a higher base saturation in the B horizon. Horseshoe and Josephine soils have a lower base saturation in the B horizon. McCarthy soils are shallower to bedrock.

Typical pedon of Cohasset cobbly loam, 15 to 30 percent slopes, 3/8 mile west of Baxter, 75 feet west of dirt road, 1,200 feet east and 1,000 feet south of northwest corner sec. 31, T. 16 N., R. 11 E.

O1-O2—3 inches to 0; litter, duff, and partly decomposed organic matter.

A11—0 to 9 inches; dark brown (7.5YR 3/2) cobbly loam, dark reddish brown (5YR 3/2) with common dark reddish brown (5YR 3/3) concretions moist; weak fine granular structure; soft, very friable, slightly sticky, and slightly plastic; many very fine, fine, and medium roots; many very fine and fine interstitial pores; 15 percent rounded and subrounded andesitic cobbles; slightly acid (pH 6.3); clear smooth boundary.

A12—9 to 18 inches; reddish brown (5YR 4/4) cobbly loam, dark reddish brown (5YR 3/4) with common dark reddish brown (5YR 3/3) concretions moist; weak fine granular structure; soft, very friable, slightly sticky, and slightly plastic; many very fine, fine, and medium roots; many very fine and fine tubular and interstitial pores; 10 percent fine concretions and 15 percent cobbles; medium acid (pH 6.0); gradual smooth boundary.

B1t—18 to 29 inches; reddish brown (5YR 4/4) cobbly heavy loam, dark reddish brown (2.5YR 3/4) with common black (N 1/0) and dark reddish brown (5YR 3/3) concretions moist; weak medium granular structure; slightly hard, friable, sticky, and slightly plastic; many very fine and medium roots; many very fine and fine tubular and interstitial pores; few thin patchy clay films; 10 percent fine concretions and 15 percent cobbles; medium acid (pH 5.7); gradual smooth boundary.

B21t—29 to 39 inches; yellowish red (5YR 4/6) cobbly clay loam, dark red (2.5YR 3/6) with common black (N 1/0) concretions moist; weak medium subangular blocky structure; slightly hard, friable, sticky, and slightly plastic; many very fine and medium roots; many very fine and fine tubular and interstitial pores; few thin clay films lining pores; 10 percent fine concretions and 20 percent cobbles; strongly acid (pH 5.5); clear smooth boundary.

B22t—39 to 57 inches; strong brown (7.5YR 5/6) cobbly clay loam, yellowish red (5YR 4/6) with common black (N 1/0) concretions moist; moderate medium subangular blocky structure; hard, friable, sticky, and plastic; common very fine, fine, and medium roots; common very fine and fine tubular and interstitial pores; common thin clay films lining pores and on faces of peds; 25 percent rounded and angular andesitic fragments; strongly acid (pH 5.3); clear smooth boundary.

Cr—57 to 64 inches; strong brown (7.5YR 5/8) andesitic conglomerate weathering to very cobbly clay loam, yellowish red (5YR 4/6, 5/6) moist; few medium and coarse roots; common thin clay films lining pores and faces of rocks; 60 percent angular and rounded andesitic fragments; very strongly acid (pH 5.0).

The depth to weathered andesitic conglomerate ranges from 40 to 80 inches. The profile is 2 to 10 percent fine rounded concretions.

The A horizon is dark brown, reddish brown, or brown in hue of 7.5YR and 5YR. It is 2 to 20 percent gravel and cobbles. Texture ranges from loam to cobbly loam. Thickness ranges from 10 to 22 inches. Reaction is slightly or medium acid.

The B horizon is 10 to 35 percent gravel and cobbles.

The Bt horizon is reddish brown, yellowish red, strong brown, or brown in hue of 7.5YR and 5YR. Hue ranges to 2.5YR moist. Texture is heavy loam or clay loam and in some places is modified with cobbles. Reaction ranges from medium to very strongly acid.

Cometa series

The Cometa series consists of deep, well drained claypan soils underlain by compacted alluvium. These soils are at elevations of 50 to 200 feet. Slopes are 1 to 5 percent. The average annual precipitation ranges from 18 to 23 inches. The average annual air temperature is about 62 degrees F. Natural vegetation is annual grasses, forbs, and scattered oak.

Similar to Cometa soils are the Corning, Fiddyment, and San Joaquin soils. Corning soils are gravelly and strongly acid in the B horizon. Fiddyment and San Joaquin soils are underlain by an indurated hardpan.

Typical pedon of Cometa sandy loam from an area of Cometa-Fiddyment complex, 1 to 5 percent slopes, about 6 miles northwest of Roseville, 25 feet north of

Sunset West Boulevard and 800 feet west of southeast corner sec. 1, T. 11 N., R. 5 E.

Ap—0 to 9 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; massive; hard, friable, nonsticky, and nonplastic; many very fine, fine and medium roots; many very fine and fine tubular and interstitial pores; medium acid (pH 5.6); clear smooth boundary.

A1—9 to 13 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 3/2) moist; massive; hard, friable, nonsticky, and nonplastic; many very fine, fine, and medium roots; many very fine and fine tubular and interstitial pores; medium acid (pH 6.0); clear smooth boundary.

A3—13 to 18 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 3/4) moist; massive; hard, friable, nonsticky, and nonplastic; common very fine and medium roots; many very fine and fine tubular and interstitial pores; slightly acid (pH 6.3); abrupt smooth boundary.

B21t—18 to 23 inches; brown (7.5YR 4/4) clay, dark brown (7.5YR 4/3) moist; strong medium angular blocky structure; extremely hard, firm, sticky, and very plastic; few fine exped roots; few very fine and fine tubular pores; common moderately thick clay films lining pores and on faces of peds; neutral (pH 6.8); gradual smooth boundary.

B22t—23 to 29 inches; brown (7.5YR 4/4) clay, dark brown (7.5YR 4/3) moist; strong medium angular blocky structure; extremely hard, firm, sticky, and very plastic; few fine exped roots; few very fine and fine tubular pores; common moderately thick clay films on faces of peds; common black manganese stains on faces of peds; abundant mica flecks; neutral (pH 7.1); abrupt smooth boundary.

C—29 to 60 inches; very pale brown (10YR 7/4) sandy loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable, slightly sticky, and slightly plastic; few very fine and fine exped roots; many very fine and fine interstitial pores; black manganese stains on faces of peds; neutral (pH 7.1).

The depth to compacted sandy loam alluvium ranges from 24 to 36 inches.

The A horizon is brown or light brown in hue of 10YR and 7.5YR. It is less than 1 percent organic matter Thickness ranges from 10 to 22 inches. Reaction is slightly or medium acid.

The B horizon is brown, dark brown, reddish brown, or yellowish red in hue of 5YR and 7.5YR. It is clay or heavy clay loam. Reaction is slightly acid or neutral.

The C horizon is compacted alluvium. In places the upper part is hard and has brittle silica cemented lenses

Corning series

The Corning series consists of very deep, well drained claypan soils underlain by alluvium. These soils are at elevations of 100 to 240 feet. Slopes are 2 to 15 percent. The average annual precipitation ranges from 19 to 25 inches. The average annual air temperature is about 62 degrees F. Natural vegetation is annual grasses, forbs, and weeds.

Similar to Corning soils are the Cometa and Redding soils. Cometa soils are slightly acid to neutral in the argillic horizon. Redding soils are underlain by an indurated hardpan.

Typical pedon of Corning gravelly loam from an area of Redding and Corning gravelly loams, 2 to 9 percent slopes, 1.25 miles northeast of Sheridan, 40 feet south of a graveled road, 700 feet east of W1/4 corner sec. 7, T. 13 N., R. 6 E.

O1—1 inch to 0; dried, partly decomposed thatch of grass stems, leaves, roots, and organic matter; abrupt smooth boundary.

A11—0 to 8 inches; reddish brown (5YR 4/4) gravelly loam, dark reddish brown (2.5YR 3/4) moist with few medium faint dark reddish brown (5YR 3/3) mottles, moist; massive; slightly hard, friable, sticky, and slightly plastic; many very fine and fine roots; many very fine, fine, and medium tubular and interstitial pores; 20 percent pebbles; strongly acid (pH 5.5); clear smooth boundary.

A12—8 to 18 inches; yellowish red (5YR 5/6) with lighter areas of very pale brown (10YR 7/4) gravelly loam, reddish brown (2.5YR 4/4, 5YR 4/4) moist; many medium very dark gray (N 3/0) manganese stains; weak medium granular structure; slightly hard, friable, sticky, and slightly plastic; common very fine and fine roots; many very fine, fine, and medium tubular and interstitial pores; 20 percent gravel; strongly acid (pH 5.5); clear wavy boundary.

A3—18 to 22 inches; red (2.5YR 4/6) gravelly loam, dark reddish brown (2.5YR 3/4) and dark red (2.5YR 3/6) moist; brown (7.5YR 5/4) coatings and many very dark gray (N 3/0) manganese stains; weak medium subangular blocky structure; slightly hard, friable, sticky, and plastic; common very fine and fine roots; many very fine, fine, and medium tubular and interstitial pores; few thin clay films bridging quartz grains; 20 percent gravel; strongly acid (pH 5.3); abrupt smooth boundary.

B21t—22 to 32 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; brown (7.5YR 5/4) coating on faces of peds; moderate medium prismatic structure parting to strong medium angular blocky; extremely hard, very firm, sticky, and very plastic; common very fine and fine exped roots; many very fine tubular pores; many thick clay films on faces of peds

and lining pores; 5 percent gravel; very strongly acid (pH 5.0); clear smooth boundary.

B22t—32 to 36 inches; variegated red (2.5YR 4/6) and dark red (2.5YR 3/6) clay, variegated reddish brown (5YR 4/4) and dark red (2.5YR 3/6) moist; moderate medium prismatic structure parting to strong angular blocky; extremely hard, firm, sticky, and very plastic; few very fine and fine exped roots; common very fine and fine tubular pores; many thick clay films on faces of peds and lining pores; 5 percent gravel; very strongly acid (pH 4.5); abrupt smooth boundary.

B3t—36 to 40 inches; variegated red (2.5YR 4/6) and dark red (2.5YR 3/6) gravelly clay loam, reddish brown (5YR 4/4) and dark red (2.5YR 3/6) moist; strong medium platy structure; very hard, friable, slightly sticky, and slightly plastic; few very fine and fine exped roots; common very fine and fine tubular pores; common thin clay films lining pores; 20 percent gravel; strongly acid (pH 4.5); clear smooth boundary.

C—40 to 60 inches; strong brown (7.5YR 5/6) clay loam, dark brown (7.5YR 4/4) moist; many fine red (2.5YR 4/6) coatings on faces of peds; strong medium platy structure; very hard, friable, sticky, and slightly plastic; few very fine and fine exped roots; many very fine and fine tubular and interstitial pores; common thin clay films lining pores; 5 percent gravel; strongly acid (pH 5.2).

The depth of the solum is 25 to 48 inches.

The A1 horizon is reddish brown, yellowish red, or brown in hue of 5YR and 7.5YR. It is 15 to 30 percent rounded quartzose gravel. Thickness ranges from 12 to 22 inches. Reaction is medium or strongly acid.

The B horizon is red, dark red, or reddish brown in hue of 2.5YR or 5YR. In places the B3t has hue of 7.5YR. Reaction is strongly or very strongly acid in the B horizon. Reaction is medium or strongly acid in the C horizon.

Dubakella series

The Dubakella series consists of moderately deep, well drained soils underlain by serpentinitic bedrock. These soils formed in upland areas. They are at elevations of 1,000 to 4,000 feet. Slopes are 9 to 50 percent. The average annual precipitation ranges from 40 to 60 inches. The average annual air temperature is about 57 degrees F. Natural vegetation is annual grasses, brush, and Digger pine.

Similar to Dubakella soils are the Argonaut and Henneke soils. Argonaut soils are not formed from serpentine rock and are in a thermic temperature zone. Henneke soils are less than 20 inches deep to a lithic contact and are in the thermic temperature zone.

Typical pedon of Dubakella very stony loam, 9 to 50 percent slopes, about 1 1/2 miles southeast of Weimar, in a roadcut on the north side of Ponderosa Way, 400 feet south and 500 feet west of E1/4 corner sec. 34, T. 14 N., R. 9 E.

A11—0 to 4 inches; reddish brown (5YR 5/3) very stony loam, dark reddish brown (5YR 3/2) moist; strong medium and coarse granular structure; soft, friable, slightly sticky, and slightly plastic; many very fine and common fine roots; many very fine and fine interstitial pores; 35 percent stones and cobbles and 25 percent gravel; neutral (pH 6.8); clear wavy boundary.

A12—4 to 17 inches; reddish brown (5YR 5/4) very cobbly clay loam, dark reddish brown (5YR 3/4) mosit; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky, and slightly plastic; common very fine and fine roots; many very fine and common fine tubular and interstitial pores; 30 percent cobbles and 20 percent gravel; neutral (pH 7.0); clear wavy boundary.

B2t—17 to 31 inches; brown (10YR 4/3) cobbly clay, dark yellowish brown (10YR 3/4) moist; strong fine and medium prismatic structure; very hard, firm, sticky, and plastic; few very fine roots; few very fine tubular pores; many moderately thick clay films on faces of peds and lining pores; 15 percent cobbles with continuous thick clay films; mildly alkaline (pH 7.5); gradual irregular boundary.

Cr—31 to 38 inches; blue-green, partly weathered serpentinized rock; cracks filled with soil material similar to that in the B2t horizon with thick, nearly continuous clay films and dark coatings on fracture planes; abrupt wavy boundary.

R—38 inches; hard serpentinized bedrock.

The depth to partly weathered serpentinized rock is 21 to 33 inches. The depth to serpentinized hard bedrock ranges from 28 to 48 inches. The content of coarse fragments ranges from 35 to 65 percent in the A horizon and from 15 to 30 percent in the Bt horizon.

The A horizon is brown, dark brown, or reddish brown in hue of 5YR or 7.5YR. Thickness ranges from 6 to 17 inches. Reaction is slightly acid or neutral.

The B horizon is brown, dark brown, or reddish brown in hue of 5YR, 7.5YR, or 10YR. It is clay loam or clay, modified by gravel, cobbles or stones. Reaction is slightly acid to mildly alkaline.

Dubakella soils in this survey area have less gravel and cobbles in the control section than is defined as the range for the series. This difference, however, does not significantly affect their use and management.

Exchequer series

The Exchequer series consists of shallow, somewhat excessively drained soils underlain by hard andesitic

breccia. These soils formed on the tops and sides of volcanic tabular ridges. They are at elevations of 100 to 1,000 feet. Slopes are 2 to 30 percent. The average annual precipitation ranges from 20 to 35 inches. The average annual air temperature is about 61 degrees F. Natural vegetation is annual grasses, forbs, and scattered oak.

Similar to Exchequer soils are the Auburn and Inks soils. Auburn soils have a cambic horizon. Inks soils have an argillic horizon.

Typical pedon of Exchequer very stony loam, 2 to 15 percent slopes, 5.5 miles north of Roseville, 5,400 feet east of Highway 65, SE1/4SE1/4 sec. 34, T. 12 N., R. 6 E.

A11—0 to 1 inch; brown (7.5YR 4/4) very stony loam, dark brown (7.5YR 3/2) moist; massive; slightly hard, friable, nonsticky, and nonplastic; many very fine roots; many very fine pores; medium acid (pH 5.6); abrupt smooth boundary.

A12—1 to 11 inches; brown (7.5YR 5/4) cobbly loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, and slightly plastic; many very fine roots; many very fine and fine tubular and interstitial pores; medium acid (pH 6.0); abrupt slightly irregular boundary.

R—11 inches; andesitic breccia.

The depth to bedrock and the thickness of the solum range from 8 to 20 inches. Stones and large cobbles cover 1 to 5 percent of the surface. The profile is 10 to 25 percent gravel and cobbles.

The A horizon is brown, grayish brown, yellowish brown, or reddish brown in hue of 10YR, 7.5YR, or 5YR. Reaction is slightly or medium acid.

The andesitic breccia bedrock has deep cracks 6 to 12 inches wide running approximately northeast and northwest.

Fiddyment series

The Fiddyment series consists of moderately deep, well drained soils underlain by indurated siltstone or sandstone. These soils formed on undulating to gently rolling terraces. They are at elevations of 50 to 200 feet. Slopes are 1 to 9 percent. The average annual precipitation ranges from 18 to 22 inches. The average annual air temperature is about 62 degrees F. Natural vegetation is annual grasses and forbs.

Similar to Fiddyment soils are the Cometa, Kaseberg, and San Joaquin soils. Cometa soils are very deep and have a claypan. Kaseberg soils are shallow and do not have an argillic horizon. San Joaquin soils have a claypan over a duripan.

Typical pedon of Fiddyment loam from an area of Fiddyment-Kaseberg loams, 2 to 9 percent slopes, 3.7 miles northwest of Roseville, 165 feet north and 555 feet east of southwest corner sec. 30, T. 10 N., R. 6 E.

Ap—0 to 9 inches; light yellowish brown (10YR 6/4) loam, dark brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky, and slightly plastic; many very fine and fine roots; many very fine tubular and interstitial pores; strongly acid (pH 5.5); clear wavy boundary.

A12—9 to 12 inches; light yellowish brown (10YR 6/4) silt loam, dark brown (7.5YR 4/4) moist; common fine distinct yellowish brown (10YR 5/6) mottles; massive; hard, friable, sticky, and slightly plastic; common very fine roots; common very fine tubular and interstitial pores; medium acid (pH 5.6); abrupt smooth boundary.

B21t—12 to 19 inches; brown (10YR 5/3) clay loam, dark brown (7.5YR 4/4) moist; moderate medium and coarse prismatic structure; very hard, firm, sticky, and plastic; few very fine roots; many very fine tubular pores; few thin clay films lining pores and bridging mineral grains; slightly acid (pH 6.3); gradual smooth boundary.

B22t—19 to 25 inches; yellowish brown (10YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; moderate medium and coarse prismatic structure; very hard, firm, sticky, and plastic; few very fine roots; common very fine tubular pores; common thin clay films lining pores and bridging mineral grains and many moderately thick clay films on faces of peds; slightly acid (pH 6.5); abrupt wavy boundary.

B23t—25 to 28 inches; yellowish brown (10YR 5/4) clay loam, dark brown (10YR 3/4) moist; moderate coarse prismatic structure; very hard, firm, sticky, and plastic; few very fine roots; few very fine tubular poes; many moderately thick clay films lining pores, bridging mineral grains, and on faces of peds; neutral (pH 6.8); abrupt wavy boundary.

Csim—28 to 35 inches; light yellowish brown (10YR 6/4) and very pale brown (10YR 7/3) indurated duripan, brown (10YR 5/3) coatings on horizontal fracture plates of silty material, dark yellowish brown (10YR 3/4) and yellowish brown (10YR 5/4) moist; massive; extremely hard, extremely firm; neutral (pH 7.0); abrupt smooth boundary.

R—35 inches; siltstone; massive; very hard, extremely firm, nonsticky, and nonplastic; mildly alkaline (pH 7.5).

The depth to indurated sandstone or siltstone ranges from 20 to 37 inches.

The A horizon is light yellowish brown, grayish brown, pale brown, or brown in hue of 10YR or 7.5YR. Thickness ranges from 6 to 20 inches. Reaction is medium or strongly acid.

The B horizon is yellowish brown, brown, or pale brown. Reaction is slightly acid or neutral.

Henneke series

The Henneke series consists of shallow, well drained soils underlain by hard serpentinized rock. These soils are in a discontinuous belt from Auburn north to Orr Creek along the east side of Highway 49. They are at elevations of 1,200 to 1,700 feet. Slopes are 5 to 50 percent. The average annual precipitation ranges from 30 to 40 inches. The average annual air temperature is about 60 degrees F. Native vegetation is annual grasses, chamise, and Digger pine.

Similar to Henneke soils are the Argonaut and Dubakella soils. Argonaut soils formed from basic rock. Dubakella soils do not have a lithic contact above 20 inches and are mesic.

Typical pedon of Henneke gravelly loam from an area of Henneke-Rock outcrop complex, 5 to 50 percent slopes, 1 mile north of Auburn, 530 feet south of W1/4 corner sec. 3, T. 12 N., R. 8 E.

A1—0 to 3 inches; reddish brown (5YR 4/3) gravelly loam, dark reddish brown (5YR 3/2) moist; strong very fine granular structure; slightly hard, friable, nonsticky, and slightly plastic; common very fine roots; many very fine tubular and interstitial pores; slightly acid (pH 6.3); abrupt smooth boundary.

B1—3 to 10 inches; yellowish red (5YR 4/6) very gravelly clay loam, dark reddish brown (5YR 3/3) moist; strong very fine granular structure; slightly hard, friable, slightly sticky, and slightly plastic; few very fine roots; common very fine tubular and interstitial pores; slightly acid (pH 6.5); clear irregular boundary.

B2t—10 to 18 inches; reddish brown (5YR 4/3) very gravelly clay, dark reddish brown (5YR 3/3) moist; strong medium and fine subangular blocky structure; hard, firm, sticky, and plastic; few very fine roots with few fine roots spreading out horizontally; common very fine tubular pores; continuous thin clay films lining pores; neutral (pH 6.8); abrupt irregular boundary.

R—18 inches; ultrabasic rocks (serpentine).

The depth to ultrabasic rock (serpentine) ranges from 10 to 20 inches.

The A horizon is reddish brown or yellowish red. Moist value and chroma are 3 or less. This horizon is 15 to 20 percent coarse fragments by volume. Thickness ranges from 1 to 4 inches.

The B2t horizon is reddish brown, brown, or dark brown in hue of 7.5YR or 5YR. The B horizon is 35 to 50 percent coarse fragments.

Horseshoe series

The Horseshoe series consists of very deep, well drained soils underlain by old alluvial river deposits. These soils formed on high mountain terraces. They are at elevations of 3,000 to 4,000 feet. Slopes are 2 to 30 percent. The average annual precipitation ranges from 40 to 60 inches, some of which falls as snow. The average annual air temperature ranges from 50 to 59 degrees F. Native vegetation is coniferous hardwood forest, brush, forbs, and grass understory. Many areas have been disturbed by mining or logging operations.

Similar to Horseshoe soils are the Cohasset and Josephine soils. Cohasset soils have a base saturation of more than 35 percent throughout the argillic horizon. Josephine soils have a paralithic contact between 40 and 80 inches.

Typical pedon of Horseshoe gravelly loam, 2 to 9 percent slopes, about 1 1/2 miles southeast of Blue Canyon, 500 feet west of E1/4 corner sec. 23, T. 16 N., R. 11 E.

A11—0 to 12 inches; mixed dark grayish brown (10YR 4/2) and brown (10YR 4/3) gravelly loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, friable, sticky, and slightly plastic; many very fine, fine, and medium and few coarse roots; many very fine, fine, and medium tubular and interstitial pores; few cobbles, 15 percent gravel; many krotovinas; medium acid (pH 6.0); gradual smooth boundary.

A12—12 to 18 inches; brown (7.5YR 4/4) gravelly loam, mixed reddish brown (5YR 4/4) and dark reddish brown (5YR 3/4) moist; weak fine granular structure; soft, friable, sticky, and slightly plastic; many very fine, fine and medium roots; many very fine, fine, and medium tubular and interstitial pores; 15 percent gravel; many krotovinas; medium acid (pH 5.8); clear smooth boundary.

B11t—18 to 28 inches; mixed yellowish red (5YR 5/6, 4/6) gravelly heavy loam, dark red (2.5YR 3/6) moist; weak medium subangular blocky structure; slightly hard, friable, sticky, and plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and interstitial pores; 15 percent gravel; few thin clay films lining pores; strongly acid (pH 5.3); gradual smooth boundary.

B12t—28 to 38 inches; yellowish red (5YR 5/6) gravelly clay loam, red (2.5YR 5/6) moist; weak medium subangular blocky structure; slightly hard, friable, sticky, and plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and interstitial pores; 15 percent gravel; few thin clay films lining pores; very strongly acid (pH 5.0); clear smooth boundary.

B21t—38 to 56 inches; red (2.5YR 4/6) gravelly clay loam, dark red (2.5YR 3/6) moist; moderate medium angular blocky structure; hard, firm, sticky, and plastic; common fine and medium and few coarse roots; common fine and medium tubular pores; 15 percent gravel; common thin clay films lining pores and on faces of peds; very strongly acid (pH 4.8); gradual smooth boundary.

B22—56 to 68 inches; red (2.5YR 4/6) with dark red (2.5YR 3/6) coatings on faces of peds gravelly clay loam, dark red (2.5YR 3/6), (2.5YR 3/8) when rubbed moist; moderate medium angular blocky structure; very hard, firm, sticky, and plastic; common fine and medium and few coarse roots; common fine and medium tubular pores; 20 percent gravel; common thin clay films lining pores and on faces of peds; very strongly acid (pH 4.5); clear smooth boundary.

C—68 to 74 inches; yellowish red(5YR 5/6) gravelly clay loam, dark yellowish brown (10YR 4/4) moist, many large prominent dark red (2.5YR 3/6) clay coatings, dark red (2.5YR 3/6) moist; matrix color is yellowish red (5YR 4/8) rubbed moist; moderate medium angular blocky structure; very hard, firm, sticky, and plastic; 20 percent gravel; common thin clay films lining pores and on faces of peds; very strongly acid (pH 4.5).

The A11 horizon is 1.5 to 3 percent organic matter. It is very dark gray, dark grayish brown, or brown in hue of 7.5YR or 5YR. The A12 horizon is brown, reddish brown, or yellowish red. Thickness of the A horizon ranges from 3 to 20 inches, depending upon losses from mining, logging, or erosion. Reaction is slightly or medium acid.

The B horizon is yellowish red, red, or dark red in hue of 5YR or 2.5YR. It is 15 to 30 percent pebbles. Reaction is strongly or very strongly acid.

The C horizon is gravelly clay loam or very gravelly loam. Pebble content increases with depth. Pebbles throughout the profile are of mixed origin.

Inks series

The Inks series consists of shallow, well drained soils underlain by andesitic conglomerate. These soils formed mainly on side slopes of volcanic ridges. They are at elevations of 200 to 1,200 feet. Slopes are 2 to 50 percent. The average annual precipitation ranges from 20 to 35 inches. The average annual air temperature is about 61 degrees F. Natural vegetation is annual grasses, forbs, and blue and live oak.

Similar to Inks soils are the Auburn and Exchequer soils. Auburn soils have a cambic horizon that is interrupted by parent material. Exchequer soils do not have a diagnostic subsurface horizon.

Typical pedon of Inks cobbly loam, 2 to 30 percent slopes, 5 miles north of Rocklin, 200 feet south of Sierra College Blvd., 900 feet south and 400 feet west of northeast corner sec. 30, T. 12 N., R. 7 E.

A1—0 to 5 inches; yellowish brown (10YR 5/4) cobbly loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, slightly sticky, and slightly plastic; many very fine roots, many very fine tubular and interstitial pores; 15 percent cobbles, slightly acid (pH 6.3); clear smooth boundary.

B1t—5 to 12 inches; brown (7.5YR 5/4) very cobbly clay loam, dark brown (7.5YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, sticky, and slightly plastic; common very fine, fine, and medium roots; many very fine, fine, and medium tubular and interstitial pores; few thin clay films lining pores; 10 percent gravel and 25 percent cobbles; slightly acid (pH 6.5); clear smooth boundary.

B2t—12 to 18 inches; brown (7.5YR 5/4) very cobbly clay loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; hard, friable, sticky, and slightly plastic; common very fine, fine, and medium roots; many very fine, fine, and medium tubular and interstitial pores; 15 percent gravel and 30 percent cobbles; slightly acid (pH 6.5); abrupt wavy boundary.

R—18 inches; partly weathered consolidated andesitic conglomerate.

The depth to bedrock and the thickness of the solum range from 12 to 20 inches.

The A horizon is yellowish brown, brown, or dark brown in hue of 10YR or 7.5YR. Moist chroma and value are 3 or less. The A horizon is 15 to 20 percent coarse fragments. It is 5 to 10 inches thick. Reaction is medium or slightly acid.

The B horizon is brown, strong brown, or reddish brown in hue of 5YR or 7.5YR. It is 35 to 50 percent coarse fragments. Reaction is medium or slightly acid.

Inks variant

The Inks variant consists of moderately deep or deep, well drained soils underlain by weathered andesitic conglomerate. These soils formed in upland areas. They are at elevations of 800 to 1,200 feet. Slopes are 2 to 30 percent. The average annual precipitation ranges from 30 to 35 inches. The average annual air temperature is about 61 degrees. F. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered pine.

Similar to the Inks variant are the Inks and Sobrante soils. Inks soils have a lithic contact between 12 and 20 inches. Sobrante soils do not have a mollic epipedon and are not skeletal.

Typical pedon of Inks Variant cobbly loam, 2 to 30 percent slopes, 1.5 miles south of Auburn on edge of access road, 2,100 feet south, 2,200 feet west of northeast corner sec. 21. T. 12 N., R. 8 E.

A11—0 to 10 inches; dark brown (7.5YR 4/4) cobbly loam, dark reddish brown (5YR 3/3) moist; medium fine granular structure; soft, very friable, nonsticky, and slightly plastic; many very fine and fine roots; many very fine and fine tubular and interstitial pores; 8 percent 1 to 3 inch gravel, 15 percent cobbles; slightly acid (pH 6.5); clear smooth boundary.

A12—10 to 17 inches; brown (7.5YR 5/4) cobbly loam, dark reddish brown (5YR 3/3) moist, medium fine

subangular blocky structure; slightly hard, friable, slightly sticky, and slightly plastic; many very fine and fine roots; many very fine and fine tubular and interstitial pores; 8 percent 1 to 3 inch gravel, 15 percent cobbles; slightly acid (pH 6.5); clear smooth boundary.

B21t—17 to 29 inches; yellowish red (5YR 5/6) very cobbly clay loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, friable, sticky, and slightly plastic; common very fine and fine roots; many very fine and fine tubular and interstitial pores; few thin clay films lining pores and bridging mineral grains; 10 percent 1 to 3 inch gravel, 40 percent cobbles; slightly acid (pH 6.5); clear smooth boundary.

B22t—29 to 41 inches; reddish brown (5YR 5/4) very cobbly clay loam, reddish brown (5YR 4/4) moist; massive; hard, friable, sticky, and slightly plastic; common very fine, fine, and medium roots; common very fine and fine tubular and interstitial pores; few thin clay films lining pores and bridging mineral grains; 10 percent 1 to 3 inch gravel, 40 percent cobbles; slightly acid (pH 6.4); clear smooth boundary.

B3—41 to 51 inches; light reddish brown (5YR 6/4) very cobbly sandy clay loam, yellowish red (5YR 4/6) moist; massive; hard, friable, slightly sticky, and slightly plastic; few very fine and medium roots; common medium and fine interstitial pores; few thin clay films lining pores and bridging mineral grains; 10 percent 1 to 3 inch gravel, 40 percent cobbles; slightly acid (pH 6.3); clear wavy boundary.

R—51 inches; weathered andesitic conglomerate.

The depth to weathered bedrock and the thickness of the solum range from 30 to 54 inches.

The A horizon is brown or dark brown in hue of 7.5YR and 10YR. Moist chroma and value are 3 or less. The A horizon is 20 to 30 percent gravel and cobbles. Thickness ranges from 8 to 20 inches. Reaction is slightly or medium acid.

The B horizon is light brown, brown, reddish brown, reddish yellow, or yellowish red in hue of 5YR or 7.5YR. This horizon is 35 to 50 percent gravel and cobbles. Reaction is slightly or medium acid.

Iron Mountain series

The Iron Mountain series consists of shallow, somewhat excessively drained cobbly soils underlain by andesitic tuff-breccia. These soils formed on side slopes of volcanic ridges. They are at elevations of 3,000 to 5,000 feet. Slopes are 2 to 30 percent. The average annual precipitation ranges from 40 to 60 inches. The average annual air temperature is about 54 degrees F. Natural vegetation is annual grasses, shrubs, and some stunted conifer.

Similar to Iron Mountain soils are the McCarthy soils, which are deeper than 20 inches.

Typical pedon of Iron Mountain cobbly sandy loam from an area of Iron Mountain-Rock outcrop complex, 2 to 30 percent slopes, 2 1/2 miles northeast of Baxter, 1,500 feet northwest of E1/4 corner sec. 21, T. 16 N., R. 11 E.

O1-O2—2 inches to 0; mat of pine needles, stems, leaves, well decomposed with depth; abrupt smooth boundary.

A11—0 to 9 inches; very dark grayish brown (10YR 3/2) cobbly sandy loam, black (N 2/0) moist; weak fine granular structure; soft, very friable, nonsticky, and nonplastic; many very fine, fine, medium, and coarse roots; many very fine, fine, and medium tubular and interstitial pores; medium acid (pH 5.6); clear smooth boundary.

A12—9 to 17 inches; dark grayish brown (2.5Y 4/2) cobbly sandy loam,very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, and nonplastic; many very fine, fine, medium, and coarse roots spreading out horizontally; many very fine, fine, and medium tubular and interstitial pores; medium acid (pH 5.6); abrupt wavy boundary.

R—17 inches; andesitic tuff-breccia.

The depth to andesitic tuff-breccia ranges from 5 to 20 inches. Stones and cobbles cover 5 to 10 percent of the surface.

The A horizon is black, very dark, grayish brown, or dark grayish brown in hue of 10YR. It is 20 to 35 percent cobbles.

Josephine series

The Josephine series consists of deep, well drained soils underlain by weathered metamorphic bedrock. These soils formed in mountainous uplands. They are at elevations of 1,500 to 4,500 feet. Slopes are 2 to 70 percent. The average annual precipitation ranges from 35 to 60 inches, some of which falls as snow. The average annual air temperature ranges from 50 to 59 degrees F. Natural vegetation is conifer-hardwood forest and some brush, forbs, and grass.

Similar to Josephine soils are the Boomer and Mariposa soils. Boomer soils have an argillic horizon and a base saturation above 35 percent. Mariposa soils have bedrock within 40 inches of the surface.

Typical pedon of Josephine loam, 15 to 30 percent slopes, 4 miles northeast of Colfax, 1,100 feet north and 100 feet east of southwest corner sec. 18, T. 15 N., R. 10 E.

O1-O2—2 inches to 0; litter, duff, and partially decomposed organic matter.

A11—0 to 4 inches; brown (7.5YR 5/4) loam, mixed brown and dark reddish brown (7.5Y 4/4, 5YR 3/4) moist; weak fine granular structure; slightly hard, friable, slightly sticky, and slightly plastic; common fine roots; many very fine and fine tubular and interstitial pores; 10 percent fine pebbles; slightly acid (pH 6.2); clear smooth boundary.

A12—4 to 11 inches; brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/4) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, and slightly plastic; many fine and medium roots; many very fine and fine tubular and interstitial pores; 10 percent fine pebbles; medium acid (pH 6.0); clear smooth boundary.

B1t—11 to 20 inches; reddish yellow (5YR 6/6) light clay loam, yellowish red (5YR 4/6) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky, and slightly plastic; many fine, medium, and coarse roots; few thin clay films lining pores and on faces of peds; 10 percent fine pebbles; medium acid (pH 5.8); clear smooth boundary.

B2t—20 to 36 inches; reddish yellow (5YR 6/8) clay loam, yellowish red (5YR 4/8) moist; moderate medium subangular blocky structure; hard, friable, sticky, and slightly plastic; common fine and medium roots; many very fine and fine tubular and interstitial pores; many thin clay films lining pores and on faces of peds; 10 percent fine pebbles; strongly acid (pH 5.5); clear wavy boundary.

B3t—36 to 52 inches; reddish yellow (5YR 6/8, 7.5YR 6/8) light silty clay loam, yellowish red (5YR 5/8) and strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; hard, friable, sticky, and slightly plastic; common fine and medium roots; many very fine and fine tubular and interstitial pores; common thin clay films lining pores and on faces of peds; 10 percent fine pebbles; strongly acid (pH 5.5); clear wavy boundary.

Cr—52 inches; soft weathered slate, becoming harder with depth; very strongly acid (pH 4.5).

The depth to soft metamorphic rock ranges from 40 to more than 60 inches.

The A and the upper part of the B horizons are 5 to 15 percent weathered pebbles. The lower part of the B horizon is 10 to 50 percent pebbles. Most pebbles are less than 1 inch, but in the B3 horizon they range to about cobble size.

The A horizon is brown, reddish yellow, or reddish brown in hue of 5YR or 7.5YR. It is 5 to 15 inches thick. Reaction is medium or strongly acid.

The B horizon is reddish yellow, yellowish red, or strong brown in hue of 7.5YR or 5YR. It is clay loam or silty clay loam and in places is gravelly. Reaction is medium or strongly acid.

Kaseberg series

The Kaseberg series consists of shallow, well drained soils underlain by indurated siltstone. These soils formed on undulating to gently rolling low terraces. They are at elevations of 75 to 135 feet. Slopes are 2 to 9 percent. The average annual precipitation ranges from 17 to 22 inches. The average annual air temperature is about 62 degrees F. Natural vegetation is annual grasses and forbs.

Similar to Kaseberg soils are the Fiddyment soils. Fiddyment soils have an argillic horizon.

Typical pedon of Kaseberg loam from an area of Fiddyment-Kaseberg loams, 2 to 9 percent slopes, on the top of a knoll 3.5 miles southwest of Lincoln, 2,200 feet west and 70 feet north of southeast corner sec. 33, T. 12 N., R. 6 E.

Ap—0 to 6 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 4/3) moist; few fine distinct yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky, and slightly plastic; common very fine roots; common very fine tubular pores; medium acid (pH 6.0); abrupt smooth boundary.

B2—6 to 14 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky, and slightly plastic; common very fine roots; common very fine and fine tubular and interstitial pores; slightly acid (pH 6.5); abrupt wavy boundary.

C1—14 to 16 inches; light gray (2.5Y 7/2) silt loam, light olive brown (2.5Y 5/4) moist; common fine distinct yellowish brown (10YR 5/8) mottles; massive; very hard, extremely firm, slightly sticky, and slightly plastic; common very fine tubular pores; slightly acid (pH 6.3); abrupt wavy boundary.

C2sim—16 to 17 inches; silica cemented duripan.

C3r—17 inches; light gray (10YR 7/2) siltstone.

The depth to indurated siltstone ranges from 10 to 20 inches.

The A horizon is light brownish gray, light yellowish brown, and pale brown in hue of 2.5Y, 10YR, 7.5YR. In places it has common distinct mottles. Thickness ranges from 6 to 13 inches. Reaction is slightly or medium acid.

The B horizon ranges from pale brown to brown in 10YR hue. Mottles are in some pedons. Reaction ranges from slightly to medium acid.

Some pedons have a C horizon. The silica layer coating the top of the siltstone ranges from 1 to 5 mm. Reaction ranges from slightly acid to moderately alkaline in the siltstone.

Kilaga series

The Kilaga series consists of very deep, well drained soils underlain by mixed alluvium. These soils formed on alluvial and old terrace positions. They are at elevations

of 75 to 150 feet. Slopes are 0 to 2 percent. The average annual precipitation ranges from 18 to 23 inches. The average annual air temperature is about 62 degrees F. Native vegetation is annual grasses, forbs, and valley oak.

Similar to Kilaga soils are the Cometa and Ramona soils. Cometa soils have a dense clay B horizon with an abrupt upper boundary. Ramona soils have an argillic horizon with less than 35 percent clay.

Typical pedon of Kilaga loam, approximately 1.5 miles southwest of Lincoln, 40 feet south of Moore Road, 600 feet east of northwest corner sec. 21, T. 12 N., R. 6 E.

Ap—0 to 10 inches; strong brown (7.5YR 5/6) loam, dark reddish brown (5YR 3/4) moist; massive; slightly hard, friable, nonsticky, and slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; slightly acid (pH 6.5); abrupt smooth boundary.

A3—10 to 19 inches; strong brown (7.5YR 5/6) heavy loam, reddish brown (5YR 4/4) moist; massive; hard, friable, slightly sticky, and slightly plastic; few very fine tubular and interstitial pores; few thin clay films lining pores and bridging mineral grains; slightly acid (pH 6.5); clear wavy boundary.

B1t—19 to 30 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; very hard, friable, sticky and plastic; few very fine roots; common very fine and fine tubular and interstitial pores; many moderately thick clay films lining pores and on faces of peds; neutral (pH 7.0); gradual wavy boundary.

B2t—30 to 56 inches; reddish brown (5YR 4/4) clay matrix with reddish brown (2.5YR 4/4) ped faces, dark reddish brown (2.5YR 3/4) moist; moderate coarse prismatic structure and strong medium and coarse angular blocky, very hard, firm, sticky, and plastic; few very fine roots; few very fine tubular pores; continuous thick clay films on faces of peds and lining pores; neutral (pH 7.3); gradual wavy boundary.

B3t—56 to 83 inches; reddish brown (5YR 4/4) sandy clay loam matrix with reddish brown (2.5YR 4/4) ped faces, dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; very hard, friable, sticky, and plastic; few very fine roots; common very fine and fine tubular and interstitial pores; many moderately thick clay films lining pores and bridging mineral grains; moderately alkaline (pH 7.9).

The depth to stratified alluvium ranges from 60 to 85 inches.

The A horizon is brown or strong brown in hue of 10YR or 7.5YR in areas adjacent to lower terraces and streams. On higher terraces, it is redder in hue. Thickness is 14 to 19 inches. Reaction ranges from slightly to medium acid.

The B1t and the B2t horizons are reddish brown, yellowish red, or strong brown in hue of 5YR or 7.5YR. They are clay loam, clay, or sandy clay. Manganese stains appear in places in the B2t horizon. The B3 horizon is reddish brown, brown, or strong brown in hue of 5YR or 7.5YR. It is sandy clay loam or clay loam. Reaction is neutral to moderately alkaline.

The C horizon is mixed alluvium, primarily of granitic origin.

Mariposa series

The Mariposa series consists of shallow to moderately deep, well drained soils underlain by highly fractured, vertically tilted schist or slate. These soils formed in mountainous areas. They are at elevations of 1,500 to 4,500 feet. Slopes are 5 to 70 percent. The average annual precipitation ranges from 35 to 60 inches, some of which falls as snow. The average annual air temperature ranges from 50 to 55 degrees F. Natural vegetation is coniferous hardwood forests and scattered brush.

Similar to Mariposa soils are the Josephine and Maymen soils. Josephine soils are deeper than 40 inches. Maymen soils do not have an argillic horizon and are lithic.

Typical pedon of Mariposa gravelly loam from an area of Mariposa-Rock outcrop complex, 5 to 50 percent slopes, 2 miles north of Weimar, 1,200 feet east and 600 feet north of southwest corner sec. 15, T. 14 N., R. 9 E.

O1-O2—1/2 inch to 0; litter and duff.

A1—0 to 6 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; moderate fine granular structure; soft, friable, slightly sticky, and slightly plastic; many very fine and fine roots; many very fine and fine tubular and interstitial pores; 20 percent fine gravel; medium acid (pH 6.0); clear smooth boundary.

B1t—6 to 11 inches; reddish yellow (7.5YR 6/6) gravelly silt loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, and slightly plastic; many very fine, fine, and medium roots; many very fine and fine tubular and interstitial pores; few thin clay films lining pores; 20 percent fine gravel; medium acid (pH 5.8); clear smooth boundary.

B2t—11 to 28 inches; reddish yellow (7.5YR 7/6) gravelly clay loam, yellowish red (5YR 5/6) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky, and slightly plastic; many fine, medium, and coarse roots; many very fine and fine tubular and interstitial pores; common thin clay films lining pores and on faces of peds; 25 percent gravel; strongly acid (pH 5.5); abrupt irregular boundary.

R—28 inches; partly weathered, highly fractured slate.

The depth to weathered slate or schist ranges from 15 to 35 inches. Pebbles and cobbles are 15 to 30 percent of the profile by volume. Soil colors are related to rock differences and are variable over short distances.

The A horizon is brown, light brown, light yellowish brown, or yellowish brown in hue of 10YR or 7.5YR. Thickness is 3 to 10 inches. Reaction is slightly or medium acid.

The B horizon is reddish yellow, light brown, pink, light reddish brown, yellowish red, or reddish brown in hue of 7.5YR or 5YR. It is heavy loam, clay loam, heavy silt loam, or silty clay loam. All textures are modified by gravel. Reaction ranges from medium to very strongly acid. The B horizon is interrupted by bedrock within horizontal distances ranging from 40 to 100 inches.

Maymen series

The Maymen series consists of shallow, somewhat excessively drained soils underlain by hard metamorphic rock. These soils formed in mountainous areas. They are at elevations of 1,200 to 3,500 feet. Slopes are 9 to 75 percent. The average annual precipitation ranges from 40 to 55 inches, some of which falls as snow. The average annual air temperature ranges from 50 to 56 degrees F. Natural vegetation is brush and scattered stunted conifer and hardwood.

Similar to Maymen soils are Mariposa soils. Mariposa soils have an argillic horizon.

Typical pedon of Maymen gravelly loam from an area of Maymen-Rock outcrop complex, 50 to 75 percent slopes, 4 miles south of Colfax, 20 feet east of Colfax-Foresthill Road, 1,500 feet east and 900 feet north of southwest corner sec. 24, T. 14 N., R. 9 E.

O1-O2—1/2 inch to 0; litter and duff.

A1—0 to 2 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, friable, nonsticky, and slightly plastic; many very fine and fine roots; many very fine and fine tubular and interstitial pores; 20 percent fine gravel; medium acid (pH 6.0); clear smooth boundary.

B2—2 to 12 inches; mixed yellowish brown (10YR 5/4) and light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate fine granular structure; slightly hard, friable, slightly sticky, and slightly plastic; many very fine, fine, and medium roots; many very fine and fine tubular and interstitial pores; 25 percent fine gravel; medium acid (pH 5.8); abrupt wavy boundary.

R—12 inches; hard vertically tilted slate.

The depth to hard slate ranges from 8 to 20 inches. Pebbles and cobbles are 15 to 30 percent of the profile by volume.

The A horizon is brown in hue of 10YR or 7.5YR. Thickness ranges from 2 to 6 inches.

The B horizon is yellowish brown, light yellowish brown, or reddish yellow in hue of 10YR or 7.5YR. It is gravelly loam or gravelly silt loam. Reaction is medium or strongly acid.

McCarthy series

The McCarthy series consists of moderately deep, well drained soils underlain by weathered andesitic conglomerate. These soils formed on the tops and sides of volcanic tabular ridges. They are at elevations of 2,000 to 5,300 feet. Slopes are 5 to 50 percent. The average annual precipitation ranges from 40 to 60 inches, some of which falls as snow. The average annual air temperature ranges from 50 to 59 degrees F. Natural vegetation is conifer-hardwood forest.

Similar to McCarthy soils are the Cohasset and Iron Mountain soils. Cohasset soils are deeper and have an argillic horizon. Iron Mountain soils have a lithic contact within 20 inches of the surface.

Typical pedon of McCarthy cobbly sandy loam, 30 to 50 percent slopes, one-fourth mile south of Foresthill, 1,800 feet south and 400 feet west of northeast corner sec. 35, T. 14 N., R. 10 E.

O1-O2—1 inch to 0; litter, duff, and partly decomposed organic matter.

A11—0 to 4 inches; brown (7.5YR 4/4) cobbly sandy loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky, and nonplastic; many very fine and fine roots; many very fine and fine tubular and interstitial pores; 15 percent cobbles and 20 percent gravel; slightly acid (pH 6.2); clear smooth boundary.

A12—4 to 13 inches; brown (7.5YR 4/4) cobbly sandy loam, dark reddish brown (5YR 3/3) moist; moderate fine granular structure; soft, very friable, nonsticky, and nonplastic; many very fine, medium, and coarse roots; many very fine and fine tubular and interstitial pores; 15 percent cobbles and 20 percent gravel; slightly acid (pH 6.2); clear smooth boundary.

B21—13 to 26 inches; strong brown (7.5YR 5/6) very cobbly sandy loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; soft, friable, nonsticky, and slightly plastic; many fine, medium, and coarse roots; many very fine and fine tubular and interstitial pores; 25 percent cobbles and 25 percent gravel; medium acid (pH 6.0); gradual smooth boundary.

B22—26 to 39 inches; reddish yellow (7.5YR 6/6) very cobbly sandy loam; strong brown (7.5YR 4/6) moist; massive; slightly hard, friable, nonsticky, and nonplastic; many fine, medium, and coarse roots; many very fine and fine tubular and interstitial pores; 25

percent cobbles and 25 percent gravel; medium acid (pH 5.6); clear wavy boundary.
Cr—39 inches; weathered andesitic conglomerate.

The depth to weathered andesitic conglomerate ranges from 22 to 40 inches.

The A horizon is brown, dark brown, grayish brown, or dark grayish brown in hue of 7.5YR or 10YR. Moist chroma and value are 2 or 3. The A horizon is 15 to 35 percent gravel and cobbles by volume. Thickness ranges from 8 to 15 inches. Reaction is slightly or medium acid.

The B horizon is brown, strong brown, reddish yellow, or yellowish red in hue of 7.5YR or 5YR. It is 35 to 70 percent gravel and cobbles by volume. Reaction is medium or strongly acid.

Ramona series

The Ramona series consists of very deep, well drained soils underlain by stratified granitic sediment. These soils formed on secondary stream terraces. They are at elevations of 75 to 200 feet. Slopes are 0 to 9 percent. The average annual precipitation ranges from 14 to 20 inches. The average annual air temperature is about 62 degrees F. Natural vegetation is annual grasses, forbs, and scattered large valley oak.

Similar to Ramona soils are the Cometa and Kilaga soils. Cometa soils have an abrupt AB boundary and a clay Bt horizon. Kilaga soils have a darker surface horizon and a fine control section.

Typical pedon of Ramona sandy loam, 2 to 9 percent slopes, on gently sloping secondary stream terrace near Lincoln Airport, 1,600 feet north, 50 feet west of southeast corner sec. 7, T. 12 N., R. 6 E.

Ap—0 to 6 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky, and slightly plastic; common very fine roots; many very fine interstitial pores and common very fine tubular pores; medium acid (pH 5.7); clear smooth boundary.
A12—6 to 14 inches; light brown (7.5YR 6/4) loam, reddish brown (5YR 4/4) moist; massive; slightly hard, friable, slightly sticky, and slightly plastic; few very fine roots; many very fine interstitial pores and common very fine tubular pores; few thin clay films lining pores and bridging mineral grains; medium acid (pH 6.0); clear smooth boundary.
B1t—14 to 25 inches; mixed reddish yellow (7.5YR 6/6) and yellowish red (5YR 4/6) light sandy clay loam, yellowish red (5YR 4/6) moist; weak fine and medium subangular blocky structure; hard, firm, slightly sticky, and plastic; few very fine roots; many very fine and fine interstitial pores and common very fine tubular pores; common thin clay films lining pores and bridging mineral grains; slightly acid (pH 6.3); gradual smooth boundary.
B2t—25 to 43 inches; mixed reddish yellow (7.5YR 6/6) and yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; hard, firm, sticky, and very plastic; few very fine roots; many very fine and fine interstitial pores and common very fine tubular pores; many thin clay films lining pores and bridging mineral grains; neutral (pH 6.7); gradual wavy boundary.
B3t—43 to 55 inches; reddish yellow (7.5YR 6/6) with variegated mineral colors, sandy clay loam, yellowish red (5YR 4/6) with variegated mineral colors, moist; massive; hard, firm, sticky, and plastic; few very fine roots; many very fine and fine interstitial pores; many moderately thick clay films lining pores and bridging mineral grains; neutral (pH 6.7); gradual wavy boundary.
C—55 to 73 inches; reddish yellow (7.5YR 6/6) with variegated mineral colors, gravelly sandy loam, yellowish red (5YR 4/6) moist; massive; slightly hard, friable, nonsticky, and nonplastic; few very fine roots; many very fine and fine interstitial pores; many moderately thick clay films lining pores and bridging mineral grains; neutral (pH 7.0).

The depth to stratified granitic alluvium ranges from 48 to 70 inches.

The A horizon is light to dark brown in hue of 7.5YR and 10YR. It is less than 1 percent organic matter. Thickness ranges from 8 to 14 inches. Reaction is slightly or medium acid.

The B horizon is reddish yellow, reddish brown or yellowish red in hue of 7.5YR or 5YR. It is loam, sandy loam, or sandy clay loam. Reaction is slightly acid or neutral.

The C horizon is reddish yellow to yellowish red in hue of 7.5YR and 5YR. It is gravelly sandy loam or gravelly coarse sandy loam underlain by dense granitic alluvium.

Redding series

The Redding series consists of well drained soils that are moderately deep to a claypan and are underlain by indurated sediment. These soils are at elevations of 100 to 240 feet. Slopes are 2 to 15 percent. The average annual precipitation ranges from 19 to 25 inches. The average annual air temperature is about 62 degrees F. Natural vegetation is annual grasses, forbs, and weeds.

Similar to Redding soils are the Corning and San Joaquin soils. Corning soils do not have a duripan. San Joaquin soils have mixed mineralogy.

Typical pedon of Redding gravelly loam from an area of Redding and Corning gravelly loams, 2 to 9 percent slopes, 3 miles southeast of Sheridan, 30 feet north of gravel road, near center of SE1/4 sec. 30, T. 13 N., R. 6 E.

O1-O2—1/2 inch to 0; dried grass mat of stems, leaves, and roots, partly decomposed and rooted; abrupt boundary.

A11—0 to 4 inches; strong brown (7.5YR 5/6) gravelly loam, dark reddish brown (5YR 3/4) moist; common fine distinct yellowish red (5YR 5/6) mottles; common fine black manganese stains; weak medium granular structure; slightly hard, friable, slightly sticky, and slightly plastic; many very fine and fine roots; few fine and medium tubular pores; 20 percent rounded gravel; gradual smooth boundary.

A12—4 to 9 inches; yellowish red (5YR 5/6) gravelly loam, reddish brown (5YR 4/4) moist; common fine black manganese stains; massive; hard, friable, slightly sticky, and slightly plastic; many very fine and fine roots; few fine and medium tubular and interstitial pores; 20 percent gravel; strongly acid (pH 5.5); clear smooth boundary.

A3—9 to 14 inches; reddish brown (5YR 4/4) loam, dark reddish brown (2.5YR 3/4) and dark red (2.5YR 3/6) moist; massive; hard, friable, slightly sticky, and slightly plastic; common very fine and fine roots; few very fine, fine, and medium tubular pores; 5 percent fine rounded gravel; strongly acid (pH 5.5); abrupt smooth boundary.

B21t—14 to 21 inches; dark reddish brown (2.5YR 3/4) clay, dark reddish brown (2.5YR 3/4) moist; strong medium angular blocky structure; extremely hard, firm, sticky, and very plastic; few very fine exped roots, mainly matted on tops of peds; few very fine tubular pores; many reddish brown (5YR 5/4) thick clay films on faces of peds; strongly acid (pH 5.5); gradual smooth boundary.

B22t—21 to 28 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; strong medium subangular blocky structure; extremely hard, firm, sticky, and very plastic; few very fine and fine exped roots, matted on lower faces of peds; few very fine pores; many moderately thick clay films on faces of peds and lining pores; medium acid (pH 5.8); abrupt smooth boundary.

C1sim—28 to 42 inches; pink (7.5YR 7/4) matrix color with dark red (2.5YR 3/6) iron staining and clay coatings on oblique and vertical cracks and in bedding laminations; extremely hard, iron and silica indurated fine grained mudstone; no roots; medium acid (pH 5.8).

C2—42 to 60 inches; consolidated gravel and cobbles.

The depth of the solum is 20 to 34 inches to the top of the indurated pan.

The A horizon is brown, strong brown, yellowish red, or reddish brown in hue of 7.5YR or 5YR. It is 15 to 25 percent rounded cherty gravel and 10 to 17 inches thick. Reaction is medium or strongly acid. Some pedons have an A2 horizon.

The B horizon is dark reddish brown, reddish brown, red, or yellowish red in hue of 2.5YR or 5YR. It is heavy clay loam or clay. The gravel content is generally less than that of the surface layer. Reaction ranges from medium to very strongly acid.

San Joaquin series

The San Joaquin series consists of well drained claypan soils underlain at moderate depths by indurated granitic alluvium. These soils formed on low terraces. They are at elevations of 50 to 200 feet. Slopes are 1 to 5 percent. The average annual precipitation ranges from 19 to 25 inches. The average annual air temperature about 62 degrees F. Natural vegetation is annual grasses and forbs.

Similar to San Joaquin soils are the Cometa, Fiddyment, and Redding soils. Cometa soils do not have a duripan. Fiddyment soils have a fine-loamy control section. Redding soils have mixed mineralogy and are acid in reaction.

Typical pedon of San Joaquin sandy loam, 1 to 5 percent slopes, 2 miles west of Lincoln, 4,480 feet south of Nicolaus Rd. and 600 feet east of Nelson Lane, 800 feet north and 600 feet east of southwest corner sec. 17, T. 12 N., R. 6 E.

A11—0 to 4 inches; reddish yellow (7.5YR 6/6) sandy loam, brown (7.5YR 4/4) moist; moderate fine and medium granular structure; slightly hard, friable, nonsticky, and nonplastic; many very fine roots; many very fine interstitial pores; medium acid (pH 6.0); clear wavy boundary.

A12—4 to 15 inches; reddish yellow (7.5YR 6/6) sandy loam, yellowish red (5YR 4/6) moist; massive; hard, friable, slightly sticky, and slightly plastic; many very fine roots; many very fine and fine tubular and interstitial pores; medium acid (pH 6.0); clear wavy boundary.

B1—15 to 24 inches; reddish yellow (5YR 6/6) light clay loam, yellowish red (5YR 4/6) moist; weak medium and coarse subangular blocky structure; hard, friable, sticky, and plastic; common very fine roots; many very fine and fine tubular and interstitial pores; slightly acid (pH 6.5); abrupt wavy boundary.

B2t—24 to 35 inches; yellowish red (5YR 4/6) clay, dark reddish brown (5YR 3/4) moist; strong medium, coarse, and very coarse prismatic structure; extremely hard, very firm, sticky, and plastic; few very fine roots in cracks and on tops of prisms; few very fine tubular pores; common slickensides and pressure faces; mildly alkaline (pH 7.5); abrupt wavy boundary.

C1sim—35 to 50 inches; indurated iron-silica cemented hardpan.

C2—50 to 60 inches; stratified sandy loam and loam alluvium; impervious to roots and water.

The thickness of the solum and the depth to the duripan range from 20 to 35 inches. Gravel is 1 to 3 percent of the profile by volume.

The A horizon is brown, strong brown, reddish brown, reddish yellow, or yellowish red in hue of 7.5YR or 5YR. Thickness ranges from 8 to 15 inches. Reaction ranges from slightly to strongly acid. Strongly acid reaction results from addition of fertilizers.

The B horizon is reddish brown, reddish yellow, yellowish red, or red in hue of 2.5YR or 5YR. It is sandy clay loam, clay loam, or clay. Reaction ranges from medium acid to mildly alkaline. In some pedons the B1 horizon is thin or missing.

The C horizon consists of an indurated, silica-iron cemented duripan, generally from granitic alluvium.

Shenandoah series

The Shenandoah series consists of moderately deep, somewhat poorly drained claypan soils underlain by weathered granite. These soils formed in upland areas of foothills. They are at elevations of 200 to 500 feet. Slopes are 2 to 15 percent. The average annual precipitation ranges from 22 to 30 inches. The average annual air temperature is about 61 degrees F. Natural vegetation is annual grasses, sedges, and forbs.

Similar to the Shenandoah soils are Cometa, Corning, and San Joaquin soils. All are well drained and lack a paralithic contact.

Typical pedon of Shenandoah sandy loam from an area of Andregg-Shenandoah complex, 2 to 15 percent slopes, 600 feet west of southeast corner sec. 32, T. 14 N., R. 6 E.

Ap—0 to 10 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, friable, slightly sticky, and slightly plastic; many very fine and medium roots; many very fine and fine tubular and interstitial pores; medium acid (pH 6.0); clear smooth boundary.

A3—10 to 16 inches; dark grayish brown (10YR 4/2) sandy loam, dark brown (7.5YR 3/2) with common medium faint dark brown (7.5YR 4/2) mottles moist; massive; very hard, friable, slightly sticky, and plastic; few very fine and medium roots; many medium and very fine tubular and interstitial pores; few moderately thick clay films lining pores and bridging mineral grains; very strongly acid (pH 5.0); abrupt smooth boundary.

B21t—16 to 23 inches; grayish brown (10YR 5/2) clay with common medium faint brown (10YR 5/3) mottles, dark brown (10YR 4/3) with common medium faint brown (7.5YR 4/4) mottles moist; massive; extremely hard, firm, sticky, and very plastic; few very fine roots; few very fine tubular pores; many thick clay films lining pores; strongly acid (pH 5.3); clear smooth boundary.

B22t—23 to 29 inches; light olive brown (2.5YR 5/4) clay, olive brown (2.5Y 4/4) moist; massive; extremely hard, firm, very sticky, and very plastic; few very fine roots; few very fine tubular pores; many thick clay films lining pores; strongly acid (pH 5.5); clear smooth boundary.

B3t—29 to 34 inches; light olive brown (2.5Y 5/4) clay with common medium distinct brown (10YR 5/3) mottles, olive brown (2.5YR 4/4) with common medium distinct dark yellowish brown (10YR 4/4) mottles moist; massive; very hard, firm, sticky, and plastic; few very fine roots; few very fine tubular pores; many moderately thick clay films lining pores; strongly acid (pH 5.5); clear smooth boundary.

Cr—34 inches; weathered granodiorite; massive; hard and firm; strongly acid (pH 5.5).

The depth to weathered granitic bedrock and the thickness of the solum range from 32 to 40 inches. The water table rises within 10 to 30 inches of the surface during the winter and early in spring and drops rapidly from May to June. Unless wetted by irrigation, the profile is essentially dry from July to October.

The A horizon ranges from light brownish gray to dark grayish brown in hue of 10YR. Reaction is medium or strongly acid.

The B horizon is grayish brown, brown, or light olive brown in hue of 10YR or 2.5Y. It is heavy clay loam or clay. Reaction is medium or strongly acid.

Sierra series

The Sierra series consists of deep, well drained soils underlain by weathered granitic bedrock. These soils are at elevations of 200 to 1,000 feet. Slopes are 2 to 30 percent. The average annual precipitation ranges from 22 to 33 inches. The average annual air temperature is about 61 degrees F. Natural vegetation is annual grasses, forbs, and oak.

Similar to Sierra soils are the Andregg soils. Andregg soils do not have an argillic horizon. They have a paralithic contact above 40 inches.

Typical pedon of Sierra sandy loam, 9 to 15 percent slopes, 3 miles southwest of Auburn, 750 feet west of Scotts Corners, 75 feet south of Auburn-Folsom Road, 1,320 feet west of northeast corner sec. 32, T. 12 N., R. 8 E.

O1-O2—1 inch to 0; dried, partly decomposed litter of grass stems, roots, oak, and toyon leaves, and other vegetation.

A11—0 to 6 inches; dark grayish brown (10YR 4/2) sandy loam, dark reddish brown (5YR 3/2) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky, and slightly plastic; many very fine and fine roots; many very fine, fine, and medium tubular and interstitial pores; 5

percent fine angular gravel; neutral (pH 6.7); clear smooth boundary.

A12—6 to 12 inches; brown (7.5YR 4/4) sandy loam, dark reddish brown (5YR 3/4) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky, and slightly plastic; many very fine and fine roots; many very fine, fine, and medium tubular and interstitial pores; 5 percent fine angular gravel; slightly acid (pH 6.5); clear wavy boundary.

A3—12 to 23 inches; yellowish red (5YR 4/6) sandy loam, mixed dark red (2.5YR 3/6) red (2.5YR 4/8) moist; weak medium subangular blocky structure; hard, firm, slightly sticky, and slightly plastic; many very fine, fine, and medium and few coarse roots; many very fine, fine, and medium tubular and interstitial pores; 5 percent fine angular gravel; slightly acid (pH 6.3); clear wavy boundary

B1t—23 to 30 inches; yellowish red (5YR 4/6) sandy clay loam, dark red (2.5YR 3/6) moist; moderate medium subangular blocky structure; hard, firm, sticky, and slightly plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and interstitial pores; few thin discontinuous clay films lining pores and bridging sands and gravels; 10 percent fine gravel; slightly acid (pH 6.3); clear wavy boundary.

B2t—30 to 41 inches; red (2.5YR 4/6) clay loam, dark red (2.5YR 3/6) moist; moderate medium subangular blocky structure; very hard, firm, sticky, and plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and interstitial pores; common moderately thick clay films on faces of peds, lining pores, and bridging sands and gravels; numerous krotovinas; 10 percent fine gravel; medium acid (pH 6.0); clear wavy boundary.

Cr—41 to 66 inches; red (2.5YR 4/6) weathered granodiorite of very gravelly sandy clay loam texture, dark reddish brown (2.5YR 3/4) moist; massive; extremely hard and very firm; few medium and coarse roots following cleavages; few moderately thick clay films on faces of gravel; 70 percent fine gravel; slightly acid (pH 6.3); abrupt wavy boundary.

R—66 inches; hard granodiorite.

The depth of the solum is 35 to more than 60 inches. Depth to weathered bedrock ranges from 40 to 80 inches. Pebble content ranges from 2 to 15 percent throughout the solum.

The A1 horizon is dark grayish brown, grayish brown, or brown in hue of 10YR or 7.5YR. The A3 horizon is yellowish red or reddish brown in hue of 5YR. Thickness of the A horizon ranges from 10 to 23 inches. Reaction ranges from neutral to medium acid.

The B horizon is reddish brown, red, or yellowish red in hue of 5YR or 2.5YR. Reaction ranges from slightly to medium acid. A B3 horizon is in some pedons.

Sites series

The Sites series consists of deep, well drained soils underlain by slate, schist, or intrusive igneous rock. These soils formed in upland areas. They are at elevations of 2,000 to 4,000 feet. Slopes are 2 to 50 percent. The average annual precipitation ranges from 40 to 60 inches. The average annual air temperature ranges from 50 to 59 degrees F. Natural vegetation is conifer-hardwood forest and some brush, forbs, and grass.

Similar to Sites soils are the Aiken, Horseshoe, and Josephine soils. Aiken soils are deeply weathered. They have less than 10 percent weatherable minerals in the clay fraction of the B horizon and formed on andesitic conglomerate. Horseshoe soils have less than 35 percent clay in the B horizon and are underlain by gravelly alluvium. Josephine soils have less than 35 percent clay and very little organic matter in the B horizon.

Typical pedon of Sites loam, 15 to 30 percent slopes, 4.5 miles northeast of Colfax, 2,250 feet northeast of southwest corner sec. 18, T. 15 N., R. 10 E.

O1-O2—2 inches to 0; litter and duff.

A1—0 to 5 inches; dark reddish brown (5YR 3/4) loam, dark reddish brown (5YR 3/2) moist; weak medium granular structure; soft, friable, slightly sticky, and slightly plastic; many very fine, fine, and medium roots; many very fine and fine interstitial pores; 10 percent gravel; slightly acid (pH 6.3); clear smooth boundary.

A3—5 to 16 inches; reddish brown (5YR 4/3) loam, dark reddish brown (2.5YR 3/4) moist; weak medium granular structure; soft, friable, sticky, and slightly plastic; many very fine, fine, and medium roots; many very fine tubular and interstitial pores; 10 percent gravel; medium acid (pH 6.0); clear smooth boundary.

B1t—16 to 26 inches; red (2.5YR 4/6) clay loam, dark red (2.5YR 3/6) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky, and plastic; many very fine, fine, medium, and coarse roots; many very fine and fine tubular and interstitial pores; very few thin clay films lining pores; 10 percent gravel; medium acid (pH 5.8); gradual smooth boundary.

B21t—26 to 40 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; moderate medium subangular blocky structure; hard, firm, sticky, and plastic; many very fine, fine, medium, and coarse roots; many very fine and fine tubular and interstitial pores; few thin clay films lining pores; 15 percent gravel; strongly acid (pH 5.5); gradual smooth boundary.

B22t—40 to 65 inches; red (2.5YR 4/6) clay, red (2.5YR 4/8) moist; moderate medium angular blocky structure; hard, firm, sticky, and very plastic; common fine, medium, and coarse roots; common fine tubular pores; common moderately thick clay films on faces

of peds and lining pores; strongly acid (pH 5.2); 10 percent gravel; gradual smooth boundary.
R—65 inches; soft schistose rock masked by abundant red clay coatings.

The depth to soft schistose rock ranges from 40 inches to more than 7 feet. In most areas, it is more than 60 inches.

The A horizon is dark reddish brown, reddish brown, brown, or light brown in hue of 5YR or 7.5YR. It is 5 to 30 percent pebbles by volume. Thickness ranges from 5 to 15 inches.

The B horizon is reddish brown, reddish yellow, or red in hue of 5YR or 2.5YR. It is 5 to 15 percent slate of gravel size fragments. Reaction ranges from medium to very strongly acid.

Sobrante series

The Sobrante series consists of moderately deep, well drained soils underlain by metabasic bedrock. These soils formed in upland areas of foothills. They are at elevations of 500 to 1,600 feet Slopes are 2 to 70 percent. The average annual precipitation ranges from 20 to 36 inches. The average annual air temperature ranges from 60 to 62 degrees F. Natural vegetation is annual grasses, forbs, blue and live oak, and scattered ponderosa pine.

Similar to Sobrante soils are the Argonaut, Auburn, Boomer, Inks, and Sierra soils. Argonaut soils have a clay B horizon. Auburn soils do not have an argillic horizon Boomer soils have a lower base saturation and are in the mesic temperature regime. Inks soils are lithic and skeletal. Sierra soils have a lower base saturation and are deeper than 40 inches over hard rock.

Typical pedon of Sobrante silt loam, 2 to 15 percent slopes, 3 miles northwest of Auburn, 15 feet west of Shanley Road, 75 feet north of S1/4 corner sec. 31, T. 13 N., R. 8 E

A1—0 to 7 inches; yellowish red (5YR 4/6) silt loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; slightly hard, friable, slightly sticky, and slightly plastic; many very fine, fine, medium and coarse roots; many very fine and fine tubular and interstitial pores; slightly acid (pH 6.5); clear smooth boundary
B1t—7 to 16 inches; yellowish red (5YR 4/6) silt loam, reddish brown (5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, and slightly plastic; common very fine, fine, medium, and coarse roots; many very fine tubular pores; very few thin clay films lining pores, slightly acid (pH 6.5); clear smooth boundary.
B2t—16 to 33 inches; yellowish red (5YR 5/6) heavy loam, yellowish red (5YR 4/6) moist; weak fine subangular blocky structure; hard, friable, sticky, and slightly plastic; many medium and coarse roots; many fine and medium tubular pores; few thin clay films lining pores; slightly acid (pH 6.3); clear wavy boundary.
Cr—33 to 40 inches; soft, highly weathered basic schist; abrupt wavy boundary.
R—40 inches; hard basic schist.

The depth to bedrock ranges from 22 to 40 inches. Coarse fragments are up to 3 to 15 percent of the soil volume. The largest number of these fragments is near the surface or directly above bedrock.

The A horizon is brown, strong brown, reddish brown, or yellowish red in hue of 5YR or 7.5YR The upper 4 to 8 inches has moist value of 2 or 3. Thickness ranges from 5 to 10 inches.

The B horizon is reddish brown, yellowish red, or red in hue of 5YR or 2.5YR. It is heavy loam or light clay loam. Reaction is medium or slightly acid.

Formation of the soils

Soil has been defined as a natural body on the surface of the earth in which plants grow. It consists of organic and mineral materials (*7*).

Soils differ in their appearance, composition, management requirements, and productivity in different localities or even within very short distances in the same locality. The factors that cause soils to differ are (1) the relief or lay of the land and drainage; (2) the physical and mineralogical composition of the parent material of the soil; (3) the climate under which the soil material has accumulated; (4) the biological activity, including the plant and animal life in and on the soil; and (5) the length of time the forces of formation have acted on the soil material. Each soil is affected by all five factors, but the relative effect and importance of each varies from one soil to another.

Relief

Relief through its effect on drainage and erosion has had an important influence on soil development in the survey area. For example, the low terraces generally are gently undulating and surface drainage usually is adequate. Water ponds in shallow depressions for short periods, particularly if the soils have a hardpan layer or a compact substratum. Mounded microrelief formerly was common where the soils have a hardpan, but land leveling or cultivating has smoothed some areas. Rainwater collected in the small depressions between the mounds and, as a result, an intricate pattern of soils developed. Typically, the soils on the mounds were well aerated. Examples are the well drained Fiddyment and San Joaquin soils. As the result of periodic waterlogging, Alamo soils in the larger depressions are fine textured, dark colored, and mottled.

The deeply entrenched streams in the mountainous areas flow westward. The deep canyons are V-shaped. The remnant ridges of andesite are tabular and slope slightly to the west. The areas of metamorphic rocks are complex and steep. Many narrow ridges that lie in a northwesterly direction have dendritic drainage patterns. The topography becomes less rugged in the foothills. The areas of granodiorite are smooth and rounded. Some appear to be in a basin because they are rimmed by more resistant metamorphic rocks. There are a few alluvial bottoms and terraces along present day and Tertiary streams Most of these areas have been mined for gold.

The aspect, or the direction a slope faces, is also important in determining where some soils will form. For example, along the transition between the grass-oak and coniferous zone, Auburn soil forms on the warm south- and west-facing slopes and Boomer soil on the cooler north- and east-facing slopes.

Parent material

Parent material is one of the strongest influences on the formation of the upland soils in the survey area. Most soils in the uplands formed in place over metamorphic rock, granitic rock, or andesitic conglomerate.

Metamorphic rocks generally are not easily weathered. They usually form shallow gravelly soils that contain many rock outcrops. The metamorphic rocks are fine grained and form soils with loam and silt loam surface textures. Some of these soils are not high in fertility, probably because the sediments from which these rocks formed were previously weathered in an earlier erosion cycle. For example, Josephine soils are not so fertile as the adjacent Cohasset soils, which formed in material from andesitic rock. At the lower elevations, amphibolite schist, greenstone, and schists and slates of the Calaveras Formation form the Auburn soils. The Auburn soils are shallow silt loams with many rock outcrops. The Calaveras and Mariposa Formations are folded so that they are vertically tilted. The bedding planes of the metasedimentary schists and slates are exposed at the surface of these formations. The variability in composition of this stratification is reflected in the variation of soils within short horizontal distances. The depth and other soil characteristics change rapidly. Examples are Mariposa, Josephine, and Sites soils.

The soils formed over andesitic conglomerate are Aiken and Cohasset. The andesitic conglomerate is deeply weathered, especially in Aiken soil, because this material is porous and weathers easily The andesite is moderately fine grained and forms soils with loam and sandy loam surface textures. When the parent rock is welded tuff breccia, the rock is hard, massive, and nonporous and shows only slight signs of weathering. The shallow Iron Mountain soils formed on this parent material. This same weathering pattern is also seen at the lower elevations. Inks soils formed on conglomerate are slightly deeper and more developed than the Exchequer soil that formed on the breccia.

Soils underlain by granitic rocks occupy places where the overlying rocks were stripped away and the Sierra Nevada batholith was exposed. Here are the Sierra, Caperton, and Andregg soils. The parent rock is weathered to a considerable depth, and the soils are 2 to 5 feet deep. The weathered rocks contain many angular coarse grains of sand, mainly quartz, which form soils with coarse sandy loam surface texture. The abrasive action of the grains of sand carried by runoff water accounts for the susceptibility of these soils to erosion. The rounded landscape and the depth of the soils indicate that geologic erosion is also relatively rapid.

Narrow bands of ultrabasic rock, mainly serpentine, underlie some areas. The ultrabasic rock contains large amounts of magnesium as related to the amount of calcium. Consequently, the Dubakella and Henneke soils are very low in fertility because of the excess magnesium.

The characteristics of the terrace soils are less affected by parent material than those of the upland soils. The soils formed from dominantly granitic alluvium, for example, Cometa and San Joaquin soils, have a sandy loam surface layer. The soils formed over siltstone, for example, Fiddyment and Kaseberg soils, have a surface layer of loam and silt loam.

The relationship of parent material to soil patterns is shown on the general soil map at the back of this survey. The major difference between the groups of map units is the parent material. Many of the soil boundaries are closely related to the boundaries between different geologic formations.

Climate

Climate has a marked influence on soil formation. Heat and moisture strongly influence the kind and amount of vegetation that grows, the rate at which organic matter decomposes, the rate at which minerals weather, the removal of material from some soil horizons, and the accumulation of material in other soil horizons.

Temperature and precipitation in the survey area vary according to elevation. In the western part of the area, near the Sutter County line, the elevation is about 50 feet, the precipitation is about 18 inches, and the mean annual temperature is about 62 degrees F. The precipitation increases and the temperature decreases regularly with increasing elevation. At an elevation of 5,000 feet, the annual precipitation is about 50 to 60 inches and the mean annual temperature is about 55 degrees F. Above 3,000 feet, much of the precipitation falls as snow.

Summer in this area is hot and dry. Winter is cool and moist. There is no appreciable summer rainfall except for a few thundershowers in the mountains. Sig-

nificant rainfall generally starts early in fall, reaches a maximum in midwinter, and stops late in spring.

The content of organic matter in the soils is highest at high elevations, where the climate is cool and moist. At elevations of more than 4,800 feet, growth is not so rapid as at lower elevations because of the cool temperature and a short growing season. Nevertheless, the soils are high in organic matter because the roots of plants are generally coarse and cool temperatures do not favor rapid decomposition. At intermediate elevations, the soils have a moderate amount of organic matter, even though decomposition is rapid. Rainfall is abundant and temperatures are moderate. Vegetation is abundant and large amounts of plant residue are returned to the soil. At lower elevations, the soils are low in content of organic matter. The vegetation consists mainly of annual grasses and forbs. Even though the soils are nearly dry in summer and early in fall, the warm and moist weather in spring and late in fall favors rapid decomposition of the very fine grass roots.

Rainfall in the survey area is sufficient to leach all the soils but the Alamo and Alamo variant of lime and other water-soluble material. Surplus water in the soil during the wettest season ranges from 10 to more than 30 inches (*3*). The surplus water is retained by the soil, percolates through it, or is lost through runoff. Surface runoff, however, does not cause a major loss of water in the area. Thus, even at low elevations, enough rain falls to leach the soils of carbonates and soluble salts. Evidences of leaching are the absence of lime in most soil profiles, the presence of clay films at considerable depths in many of the soils or in the weathered rock, and the constant or decreasing pH with increasing depth of the soils.

Between elevations of about 1,600 and 5,000 feet, the soils appear to undergo the most intensive weathering because they are still moist when they warm in summer. In general, the soils at these elevations have a thicker profile and a redder, finer textured Bt horizon than soils at higher or lower elevations. Examples are Aiken and Sites soils. At elevations of 200 to 1,600 feet, the lack of moisture when the soils are warm limits the rate of weathering. On the other hand, the cooler temperatures at the higher elevations along the eastern boundary of the survey area also limit the chemical reactions required for weathering.

Argonaut soils seem to be an exception. They are at the lower elevations, but they have the clay Bt horizon associated with rapid weathering. First, there is some translocation of clay from the A horizon to the B horizon. Second, these soils formed over massive rocks on gentle and often concave slopes. The bedrock is impermeable and the topography is such that water is trapped above the bedrock. These soils stay moist longer in summer, and the rock weathers to clay.

Soils that formed under the semiarid climate of the valley, for example, Cometa and San Joaquin soils, have a light colored, massive, neutral to slightly acid surface layer and a neutral to mildly alkaline subsoil. The older soils on the high terraces, for example, Redding and Corning soils, are more acid in reaction. These facts suggest the possibility that the soils have been subject to soil-forming processes since the early part of the Pleistocene epoch and that at some previous time the climate was more humid.

Biological activity

The vegetation in the western boundary of the survey area eastward consists of grass, oak-grass intermingled in places with brush, areas of oak-grass transitional to coniferous forest, and coniferous forest. The pattern of vegetation has been affected somewhat by fires, grazing practices, clearing, and cultivation.

Terrace soils, such as Cometa, Fiddyment, and San Joaquin, formed under a grass cover. Soils having a pale A horizon that is less than 1 percent organic matter formed under a grass cover in the hot dry summer.

Soils, such as Auburn and Sobrante, formed under a cover of grass and oak grass. They have a thin A horizon about 3 to 9 inches thick and are about 1 to 2 percent organic matter. Most of these soils have been used for grazing for more than 100 years. The amount of plant residue left after grazing each year varies greatly according to grazing practices and seasonal growth. Under average grazing, the yearly addition of organic residue to the soils is estimated to be between 400 and 1,500 pounds per acre of stems and leaves and an equivalent weight of roots. Thus, about 800 to 3,000 pounds of organic matter is returned to the soil each year, mainly in the A horizon. The A horizon in most of the soils is 1 to 2 percent organic matter. Thus, unless decomposed, between 30,000 and 60,000 pounds would accumulate in the upper 9 inches of soils in 20 to 40 years. There is no evidence to indicate that the organic matter content of the soil is increasing. Consequently, it is assumed that micro-organisms cause the decomposition of the annual additions of organic matter.

Andregg and Caperton soils formed under the same plant cover and climate as Auburn and Sobrante soils, but they have a thicker dark A horizon that is more than 2 percent organic matter.

Soils in the transition zone between areas of oak-grass and areas of coniferous forest have an A horizon that is somewhat thicker and higher in content of organic matter than those soils at lower elevations. It seems that in this zone, changes in vegetation occurred because of fires or minor fluctuations in climate.

The soils formed under coniferous forest have a mat of litter and duff 1/2 inch to more than 6 inches thick. Such material is acid and contributes to the acidity of the soils. The roots of the trees follow cracks and fracture planes in the parent rock and help break up the rocks. Roots in the upper 2 or 3 feet of the soil make up more

than 20 percent of the total volume in places. Their growth and decomposition make the soil more porous. Aiken and Sites soils formed under forest where the carbon-nitrogen ratio exceeds 20.

Burning also has influenced the soils in many ways. Man and lightning are the main causes of fires. Repeated burning depletes the organic matter and thus influences the characteristics of the surface soil. Fire changes plant ecology, and different plant communities result. Thus, one of the soil-forming factors is altered.

Time

The effect of time on soil formation in the terrace areas is striking. Because the landscape is relatively stable, the position of the soils on the landscape reflects the age of the soils. In general, the lowest stream bottom consists of the most recent alluvium and the highest terrace of the oldest alluvium.

The highest terraces consist of mixed gravel, from which the Redding and Corning soils formed. These soils are well leached and have an abrupt dense clay subsoil. The lower terraces, alluvial benches, and flood plains consist of mainly nongravelly sandy sediments. In sequence downward, the soil development is progressively less distinct. From the oldest to the youngest, the soils formed in these areas are the San Joaquin, the Cometa, the Kilaga, the Ramona, and Xerofluvents.

In the upland soils, the geologic age of the parent rock does not necessarily relate to the age of the soils. None of these soils shows signs of maturity. Because of the natural slope, geologic erosion progresses at about the same rate as the soils form.

The oldest soils are those in relatively undissected areas. The youngest are those on narrow steep divides, on very steep slopes, or on other sites subject to erosion. Aiken soils, which developed on remnants of the volcanic plain as tabular ridges, are considered to be the oldest soils. Other soil materials were exposed after the volcanic plain was dissected or stripped away by erosion. Consequently, these soils are younger. Examples of the sequence of soil development in the survey area can be illustrated by Maymen, Mariposa, Josephine, and Sites soils. Maymen soils, on narrow ridge crests or adjacent steep slopes, are very shallow to shallow over hard bedrock and do not have a B2t horizon. Mariposa soils, on broader divides and less erodible side slopes than Maymen soils, are shallow to moderately deep and have a weak B2t horizon. Josephine soils, on long stable slopes or on lower gently sloping divides, are deep and have a distinct B2t horizon of clay loam. Sites soils, in the most stable positions on the landscape, have a B2t horizon of red clay. Some of the differences in the formation of these soils, however, may be related to the fact that the stratified parent rock weathers readily.

Morphology of the soils

Because the influence of the soil-forming factors varies greatly within the survey area, many different kinds of soils have formed. Many soils in the area have several prominent horizons, some have only one horizon, and others have several weak, or indistinct, horizons. Soils with prominent horizons can occur adjacent to those with less distinct horizons. The processes that have had the greatest influence in forming the different soil horizons are (1) weathering of parent materials, (2) accumulation of organic matter, (3) formation and translocation of clays, (4) influence of iron oxides, and (5) translocation of silica.

Some of the distinguishing features of the soils formed over bedrock are related to the degree of weathering of the parent material. For example, where weathering has been slight, the soils have few horizons and usually have distinguishing features that come from their parent material. The slightly weathered Maymen soils, for example, have thin, indistinct horizons. Their pale color, gravelly loam texture, and medium acid reaction are related to the underlying slate. As weathering increases, differences in horizons are less directly related to the parent material but are products of alteration. The deep Aiken soils have a red, fine textured subsoil, and their horizons contrast strongly with the underlying brownish yellow andesitic conglomerate.

In all soils of the survey area, enough organic matter has accumulated on the surface to form an A1 horizon, which ranges from a thin, faint light colored horizon to a thick, conspicuous dark colored horizon. At the lower elevations, the soils have an A1 horizon that is about 3 to 8 inches thick and about 1 percent or less organic matter. Organic matter does not accumulate in large quantities because of the warm temperature. In the eastern part of the area, cooler temperatures prevail and the A1 horizon is thicker and darker and is higher in content of organic matter. Aiken soils have a thick, dark A1 horizon that is about 6 percent organic matter in the upper 15 inches.

The translocation of silicate clay minerals is a feature of many soils in the area. The clay films on ped faces and in root channels, as well as colloidal bridges between the sand grains, indicate the movement of clay minerals from the A horizon to the B2t horizon. Auburn soils have little or no translocated clay. Cometa soils have large amounts of translocated clay. The Bt horizon is at least 15 percent more clay than the A horizon within a vertical distance of 1 inch. Evidence of clay movement is the many moderately thick continuous clay films in the Bt horizon.

Iron affects the color of many soils. In well drained soils, iron is oxidized and produces yellow and red colors. Where the iron has been translocated in the profile, the colors are more intense. Aiken and Sites soils are examples. The translocation of iron is greatest in

soils at elevations of 2,000 to 4,000 feet. Here, the temperature favors a high degree of weathering and considerable water percolates through the soil. Forest litter on the surface produces organic acids that help to release iron for downward migration. This increase is indicated in the redder color of the B2t horizon in such soils as Aiken and Sites. The reduction of iron, which is not an important process in the area but does occur in poorly drained soils, such as Alamo and Alamo variant, accounts for the black, gray, and blue-green colors, or the gleying.

The translocation and deposition of soluble silica in some soils on the terraces have provided the cementing agent for the formation of a duripan. The silica has cemented the alluvial substratum of Alamo, Redding, and San Joaquin soils. In Fiddyment and Kaseberg soils, the thin opalized silica coatings on the surface of the siltstone qualify as duripans.

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Glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2 5
Low	2 5 to 5 0
Moderate	5 0 to 7 5
High	7 5 to 10 0
Very high	More than 10 0

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex. soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Compressible. Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earth-moving equipment. The soil sloughs easily.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the

water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime. Excess carbonates. Excessive carbonates, or lime, restrict the growth of some plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forb. Any herbaceous plant not a grass or sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Landslide. The rapid downhill movement of a mass of soil and loose rock generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Pan. A compact, dense layer in a soil. A pan impedes the movement of water and the growth of roots. The word "pan" is commonly combined with other words that more explicitly indicate the nature of the layer; for example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Polypedon. A volume of soil having properties within the limits of a soil series, the lowest and most homogeneous category of soil taxonomy. A "soil individual."

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent, good, fair,* and *poor.* The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4 5 to 5.0
Strongly acid	.5 1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	.6.1 to 6 5
Neutral	.6.6 to 7.3
Mildly alkaline	7 4 to 7 8
Moderately alkaline	....7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	.9 1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces. Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-alumina ratio. The molecular ratio of silica to alumina in soil, clay, or any alumino-silicate mineral.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. Locally, a small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stone line. A concentration of coarse fragments in soils that generally marks an old weathering surface. In a

cross section, the line may be one fragment or more thick. The line generally overlies material that weathered in place and marks the top of a paleosol. It is ordinarily overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitaion is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Trace elements. The chemical elements in soils, in only extremely small amounts, essential to plant growth. Examples are zinc, cobalt, manganese, copper, and iron.

Tuff. A compacted deposit 50 percent or more volcanic ash and dust.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams emerging from hills or mountains and spreading sediments onto the lowland as a series of adjacent alluvial fans.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new

series name, but the limited geographic soil area does not justify creation of a new series.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.
Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.
Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.
Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

ILLUSTRATIONS

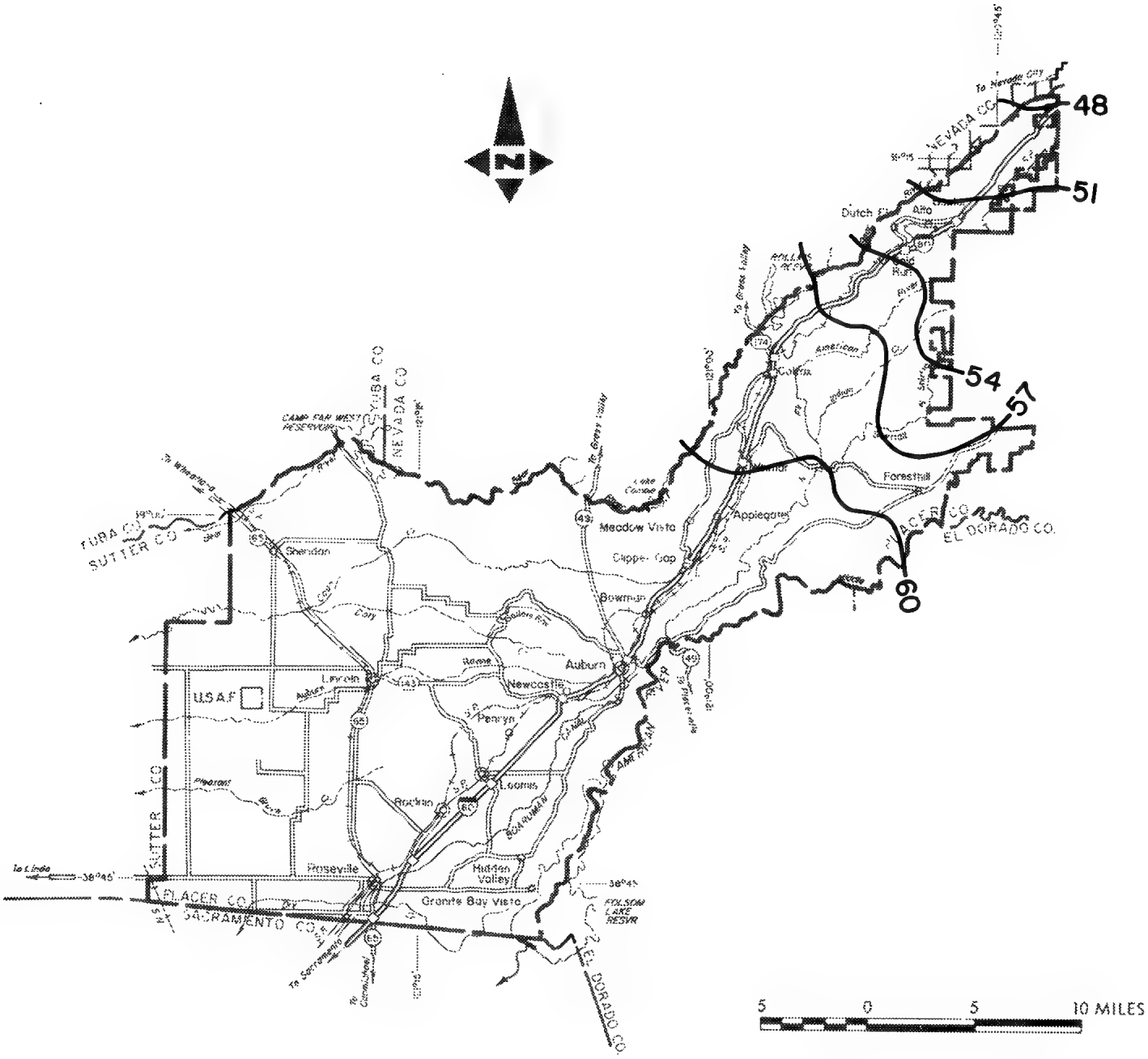

Figure 1.—Average annual air temperature

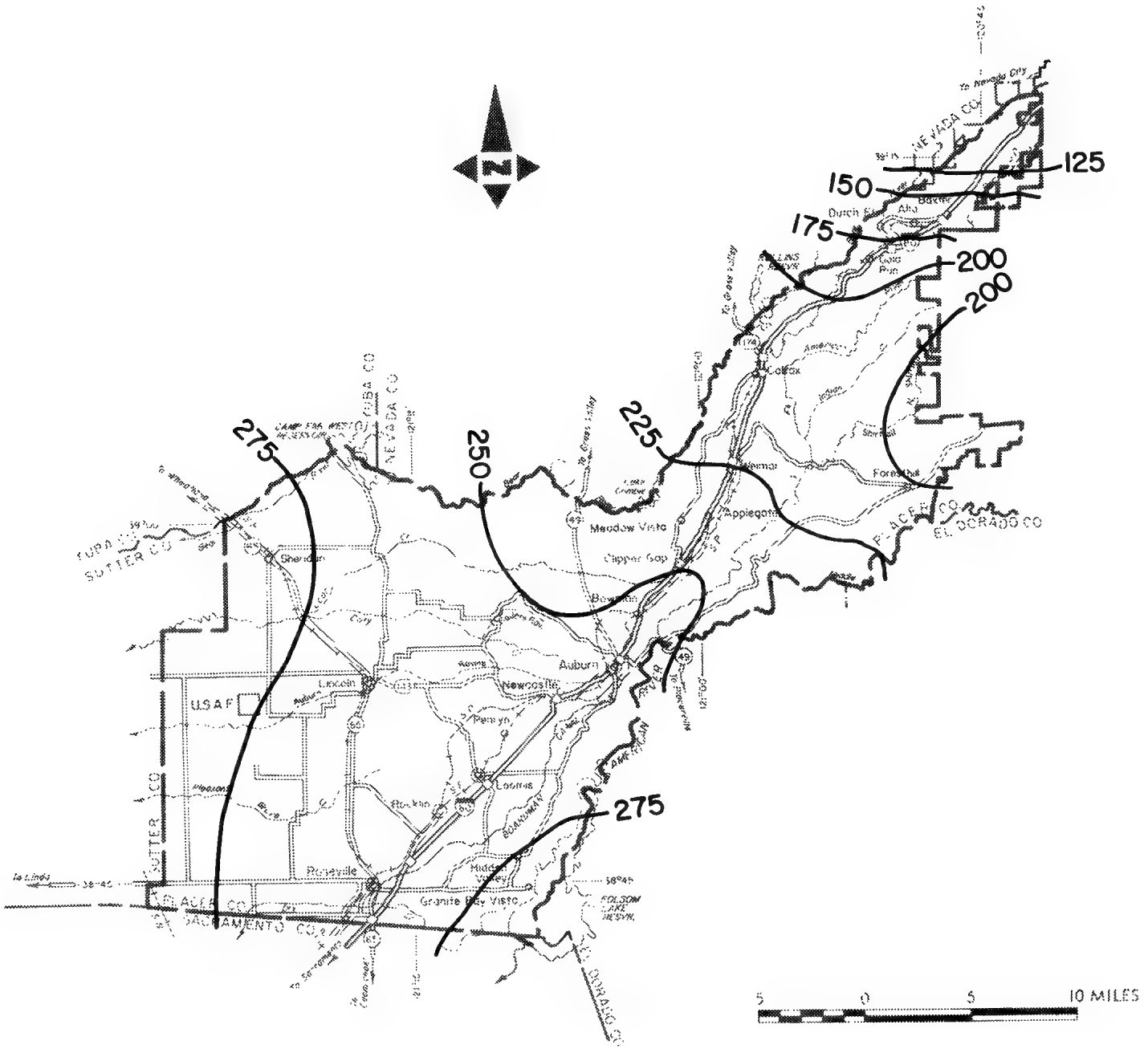

Figure 2.—Average number of days in growing season

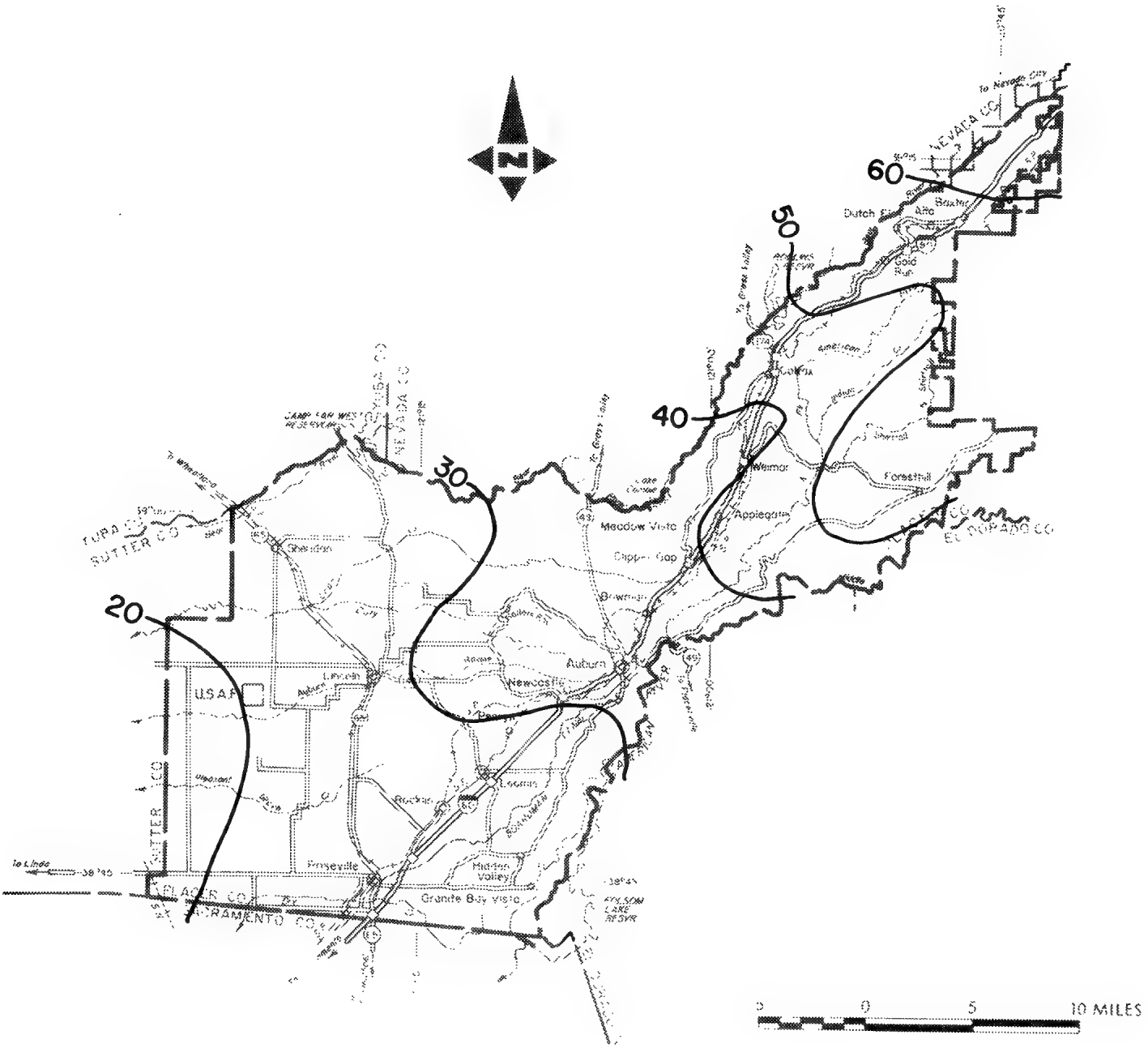

Figure 3.—Average seasonal precipitation in inches

TABLES

TABLE 1.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
100	Aiken loam, 2 to 9 percent slopes	7,150	1.7
101	Aiken loam, 9 to 15 percent slopes	660	0.2
102	Aiken cobbly loam, 2 to 15 percent slopes	1,050	0.3
103	Aiken cobbly loam, 15 to 30 percent slopes	600	0.1
104	Alamo-Fiddyment complex, 0 to 5 percent slopes	7,000	1.7
105	Alamo Variant clay, 2 to 15 percent slopes	1,600	0.4
106	Andregg coarse sandy loam, 2 to 9 percent slopes	19,100	4.6
107	Andregg coarse sandy loam, 9 to 15 percent slopes	2,650	0.6
108	Andregg coarse sandy loam, 15 to 30 percent slopes	1,175	0.3
109	Andregg coarse sandy loam, rocky, 2 to 15 percent slopes*	5,300	1.3
110	Andregg coarse sandy loam, rocky, 15 to 30 percent slopes*	1,150	0.3
111	Andregg coarse sandy loam, rocky, 30 to 50 percent slopes*	1,800	0.4
112	Andregg-Rock outcrop complex, 5 to 30 percent slopes*	2,025	0.5
113	Andregg-Shenandoah complex, 2 to 15 percent slopes	2,400	0.6
114	Auburn silt loam, 2 to 15 percent slopes	11,850	2.9
115	Auburn-Argonaut complex, 2 to 15 percent slopes	3,500	0.9
116	Auburn-Argonaut-Rock outcrop complex, 2 to 15 percent slopes	2,200	0.5
117	Auburn-Rock outcrop complex, 2 to 30 percent slopes*	10,800	2.6
118	Auburn-Sobrante silt loams, 15 to 30 percent slopes	8,500	2.1
119	Auburn-Sobrante-Rock outcrop complex, 2 to 30 percent slopes*	10,050	2.4
120	Auburn-Sobrante-Rock outcrop complex, 30 to 50 percent slopes*	7,210	1.8
121	Auburn-Sobrante-Rock outcrop complex, 50 to 70 percent slopes*	4,050	1.0
122	Boomer loam, 2 to 15 percent slopes	820	0.2
123	Boomer loam, 15 to 30 percent slopes	600	0.1
124	Boomer-Rock outcrop complex, 5 to 30 percent slopes*	1,900	0.5
125	Boomer-Rock outcrop complex, 30 to 50 percent slopes*	2,600	0.6
126	Boomer-Rock outcrop complex, 50 to 70 percent slopes	900	0.2
127	Boomer Variant stony sandy loam, 2 to 15 percent slopes	650	0.2
128	Boomer Variant very stony sandy loam, 15 to 50 percent slopes	2,615	0.6
129	Caperton gravelly coarse sandy loam, 2 to 30 percent slopes*	1,585	0.4
130	Caperton-Andregg coarse sandy loams, 2 to 15 percent slopes	6,375	1.5
131	Caperton-Andregg coarse sandy loams, 15 to 30 percent slopes	1,770	0.4
132	Caperton-Rock outcrop complex, 2 to 30 percent slopes*	2,150	0.5
133	Caperton-Rock outcrop complex, 30 to 50 percent slopes*	410	0.1
134	Cohasset loam, 2 to 9 percent slopes	575	0.1
135	Cohasset loam, 9 to 15 percent slopes	800	0.2
136	Cohasset loam, 15 to 30 percent slopes	625	0.2
137	Cohasset cobbly loam, 5 to 15 percent slopes	3,150	0.8
138	Cohasset cobbly loam, 15 to 30 percent slopes	3,310	0.8
139	Cohasset cobbly loam, 30 to 50 percent slopes	3,500	0.9
140	Cometa sandy loam, 1 to 5 percent slopes	1,300	0.3
141	Cometa-Fiddyment complex, 1 to 5 percent slopes	26,394	6.4
142	Cometa-Ramona sandy loams, 1 to 5 percent slopes	11,300	2.7
143	Dubakella very stony loam, 9 to 50 percent slopes*	1,950	0.5
144	Exchequer very stony loam, 2 to 15 percent slopes	4,205	1.0
145	Exchequer-Rock outcrop complex, 2 to 30 percent slopes*	5,350	1.3
146	Fiddyment loam, 1 to 8 percent slopes	4,200	1.0
147	Fiddyment-Kaseberg loams, 2 to 9 percent slopes	8,810	2.1
148	Henneke-Rock outcrop complex, 5 to 50 percent slopes*	770	0.2
149	Horseshoe gravelly loam, 2 to 9 percent slopes	200	**
150	Horseshoe gravelly loam, 9 to 30 percent slopes	275	0.1
151	Horseshoe-Rubble land complex, 2 to 30 percent slopes*	750	0.2
152	Inks cobbly loam, 2 to 30 percent slopes*	1,650	0.4
153	Inks cobbly loam, 30 to 50 percent slopes*	1,170	0.3
154	Inks-Exchequer complex, 2 to 25 percent slopes*	6,675	1.6
155	Inks Variant cobbly loam, 2 to 30 percent slopes	625	0.2
156	Iron Mountain-Rock outcrop complex, 2 to 30 percent slopes	840	0.2
157	Josephine loam, 2 to 9 percent slopes	330	0.1
158	Josephine loam, 9 to 15 percent slopes	600	0.1
159	Josephine loam, 15 to 30 percent slopes	2,425	0.6
160	Josephine loam, 30 to 50 percent slopes	1,200	0.3
161	Josephine-Rock outcrop complex, 15 to 50 percent slopes*	1,575	0.4
162	Kilaga loam	8,050	2.0
163	Mariposa gravelly loam, 5 to 30 percent slopes*	3,520	0.9
164	Mariposa-Josephine complex, 5 to 30 percent slopes*	9,505	2.3
165	Mariposa-Josephine complex, 30 to 50 percent slopes*	8,650	2.1
166	Mariposa-Josephine complex, 50 to 70 percent slopes*	645	0.2
167	Mariposa-Rock outcrop complex, 5 to 50 percent slopes*	10,350	2.5
168	Mariposa-Rock outcrop complex, 50 to 70 percent slopes*	10,450	2.5
169	Maymen-Rock outcrop complex, 9 to 50 percent slopes*	1,300	0.3

See footnote at end of table.

TABLE 1.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
170	Maymen-Rock outcrop complex, 50 to 75 percent slopes*	16,500	4.0
171	McCarthy cobbly sandy loam, 5 to 30 percent slopes*	1,550	0.4
172	McCarthy cobbly sandy loam, 30 to 50 percent slopes*	6,000	1.5
173	Pits and dumps*	720	0.2
174	Ramona sandy loam, 0 to 2 percent slopes	1,650	0.4
175	Ramona sandy loam, 2 to 9 percent slopes	3,050	0.7
176	Redding and Corning gravelly loams, 2 to 9 percent slopes	11,000	2.7
177	Redding and Corning gravelly loams, 9 to 15 percent slopes	1,105	0.3
178	Riverwash*	2,400	0.6
179	Rock outcrop*	7,500	1.8
180	Rubble land*	4,200	1.0
181	San Joaquin sandy loam, 1 to 5 percent slopes	9,800	2.4
182	San Joaquin-Cometa sandy loams, 1 to 5 percent slopes	15,200	3.7
183	Sierra sandy loam, 2 to 9 percent slopes	1,650	0.4
184	Sierra sandy loam, 9 to 15 percent slopes	1,500	0.4
185	Sierra sandy loam, 15 to 30 percent slopes	2,000	0.5
186	Sites loam, 2 to 9 percent slopes	1,000	0.2
187	Sites loam, 9 to 15 percent slopes	2,525	0.6
188	Sites loam, 15 to 30 percent slopes	5,150	1.3
189	Sites loam, 30 to 50 percent slopes	750	0.2
190	Sites-Rock outcrop complex, 15 to 50 percent slopes*	3,900	0.9
191	Sobrante silt loam, 2 to 15 percent slopes	1,250	0.3
192	Xerofluvents, sandy*	875	0.2
193	Xerofluvents, occasionally flooded*	4,900	1.2
194	Xerofluvents, frequently flooded*	7,675	1.9
195	Xerofluvents, hardpan substratum*	2,175	0.5
196	Xerorthents, cut and fill areas*	4,300	1.0
197	Xerorthents, placer areas*	4,950	1.2
	Water	5,050	1.2
	Total	411,544	100.0

* Broadly defined units.
** Less than 0.1 percent.

TABLE 2.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Irrigated pears	Irrigated peaches	Irrigated plums	Irrigated rice	Irrigated pasture	Non-irrigated barley	Non-irrigated wheat
	Ton	Ton	Ton	Ton	AUM*	Bu	Bu
100--- Aiken	24	---	---	---	---	---	---
101, 102--- Aiken	24	---	---	---	---	---	---
103--- Aiken	20	---	---	---	---	---	---
104--- Alamo	---	---	---	2	11	---	25
106--- Andregg	10	8	8	---	10	---	---
107--- Andregg	10	8	8	---	10	---	---
108--- Andregg	10	8	8	---	10	---	---
109--- Andregg	10	8	8	---	10	---	---
110--- Andregg	10	8	8	---	10	---	---
113--- Andregg	---	---	---	---	11	---	---
114--- Auburn	---	---	---	---	12	---	---
115--- Auburn	---	---	---	---	12	---	---
116--- Auburn	---	---	---	---	12	---	---
117--- Auburn	---	---	---	---	10	---	---
118--- Auburn	8	5	5	---	12	---	---
119--- Auburn	---	---	---	---	10	---	---
122--- Boomer	10	---	---	---	14	---	---
123--- Boomer	10	---	---	---	12	---	---
129--- Caperton	---	---	---	---	8	---	---
130--- Caperton	5	4	4	---	8	---	---
131--- Caperton	5	4	4	---	8	---	---

See footnotes at end of table.

TABLE 2.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Irrigated pears	Irrigated peaches	Irrigated plums	Irrigated rice	Irrigated pasture	Non-irrigated barley	Non-irrigated wheat
	Ton	Ton	Ton	Ton	AUM*	Bu	Bu
132---------- Caperton	---	---	---	---	8	---	---
140---------- Cometa	---	---	---	2.9	12	27	25
141---------- Cometa	---	---	---	2.9	12	27	25
142---------- Cometa	---	---	---	---	12	27	25
146---------- Fiddyment	---	---	---	2.5	10	---	22
147---------- Fiddyment	---	---	---	2.5	---	---	22
152---------- Inks	---	---	---	---	10	---	---
154---------- Inks	---	---	---	---	10	---	---
155---------- Inks variant	15	---	---	---	14	---	---
157---------- Josephine	15	---	---	---	12	---	---
158---------- Josephine	15	---	---	---	12	---	---
159---------- Josephine	10	---	---	---	12	---	---
162---------- Kilaga	---	---	---	2.5	14	---	0
163---------- Mariposa	8	---	---	---	10	---	---
164---------- Mariposa	8	---	---	---	10	---	---
174---------- Ramona	---	8	8	---	15	28	---
175---------- Ramona	---	8	8	---	15	25	---
176, 177---------- Redding	---	---	---	---	11	25	20
181---------- San Joaquin	---	---	---	2.5	12	25	20
182---------- San Joaquin	---	---	---	2.5	12	25	20
183---------- Sierra	19	15	15	---	14	40	---
184---------- Sierra	19	15	15	---	14	35	---
185---------- Sierra	15	14	15	---	14	---	---

See footnotes at end of table.

TABLE 2.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Irrigated pears	Irrigated peaches	Irrigated plums	Irrigated rice	Irrigated pasture	Non-irrigated barley	Non-irrigated wheat
	Ton	Ton	Ton	Ton	AUM*	Bu	Bu
186---------- Sites	24	---	---	---	12	---	---
187---------- Sites	24	---	---	---	12	---	---
188---------- Sites	20	---	---	---	12	---	---
191---------- Sobrante	10	8	8	---	14	---	---
192**---------- Xerofluvents	---	18	---	---	---	---	---
195**---------- Xerofluvents	---	---	---	---	12	25	25

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.

** See map unit description for the composition and behavior of the map unit.

TABLE 3.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
105---------- Alamo variant	Clayey----------	Favorable	3,500	Soft chess----------	30
		Normal	2,400	Wild oats----------	15
		Unfavorable	1,200	Burclover----------	15
				Clover----------	10
				Filaree----------	5
				Ripgut brome----------	5
				Scrub oak----------	5
				Sneezeweed----------	5
				Fescue----------	5
106, 107, 108, 109, 110, 111---------- Andregg	Granitic----------	Favorable	3,500	Soft chess----------	20
		Normal	2,500	Wild oats----------	15
		Unfavorable	1,200	Clover----------	10
				Filaree----------	10
				Blue oak----------	10
				Ripgut brome----------	5
				Red brome----------	5
				Interior live oak----------	5
				Burclover----------	5
112*:					
Andregg----------	Granitic----------	Favorable	3,500	Soft chess----------	20
		Normal	2,500	Wild oats----------	15
		Unfavorable	1,200	Clover----------	10
				Filaree----------	10
				Blue oak----------	10
				Ripgut brome----------	5
				Red brome----------	5
				Interior live oak----------	5
				Burclover----------	5
Rock outcrop.					
114---------- Auburn	Shallow Loamy----------	Favorable	3,000	Soft chess----------	25
		Normal	2,000	Wild oats----------	10
		Unfavorable	1,000	Burclover----------	10
				Whiteleaf manzanita----------	10
				Ripgut brome----------	5
				Red brome----------	5
				Foxtail fescue----------	5
				Mouse barley----------	5
				Clover----------	5
				Filaree----------	5
				Blue oak----------	5
				Interior live oak----------	5
				Buckbrush----------	5
115*:					
Auburn----------	Shallow Loamy----------	Favorable	3,000	Soft chess----------	25
		Normal	2,000	Wild oats----------	10
		Unfavorable	1,000	Burclover----------	10
				Whiteleaf manzanita----------	10
				Ripgut brome----------	5
				Red brome----------	5
				Foxtail fescue----------	5
				Mouse barley----------	5
				Clover----------	5
				Filaree----------	5
				Blue oak----------	5
				Interior live oak----------	5
				Buckbrush----------	5

See footnotes at end of table.

TABLE 3.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
115*:					
Argonaut	Shallow loamy	Favorable	3,000	Soft chess	25
		Normal	2,000	Burclover	15
		Unfavorable	1,000	Filaree	10
				Wild oats	10
				Ripgut brome	5
				Foxtail fescue	5
				Mouse barley	5
				Clover	5
				Blue oak	5
				Interior live oak	5
				Buckbrush	5
				Red brome	5
				Needlegrass	T**
116*:					
Auburn	Shallow Loamy	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oats	10
		Unfavorable	1,000	Burclover	10
				Whiteleaf manzanita	10
				Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
				Buckbrush	5
Argonaut	Shallow loamy	Favorable	3,000	Soft chess	25
		Normal	2,000	Burclover	15
		Unfavorable	1,000	Filaree	10
				Wild oats	10
				Ripgut brome	5
				Foxtail fescue	5
				Mouse barley	5
				Clover	5
				Blue oak	5
				Interior live oak	5
				Buckbrush	5
				Red brome	5
				Needlegrass	T
Rock outcrop.					
117*:					
Auburn	Shallow Loamy	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oats	10
		Unfavorable	1,000	Burclover	10
				Whiteleaf manzanita	10
				Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
				Buckbrush	5
Rock outcrop.					

See footnotes at end of table.

TABLE 3.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
118*:					
Auburn	Shallow Loamy	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oats	10
		Unfavorable	1,000	Burclover	10
				Whiteleaf manzanita	10
				Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
				Buckbrush	5
Sobrante	Loamy Foothills	Favorable	3,500	Soft chess	25
		Normal	2,400	Wild oats	10
		Unfavorable	1,200	Ripgut brome	10
				Burclover	10
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
119*, 120*:					
Auburn	Shallow Loamy	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oats	10
		Unfavorable	1,000	Burclover	10
				Whiteleaf manzanita	10
				Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
				Buckbrush	5
Sobrante	Loamy Foothills	Favorable	3,500	Soft chess	25
		Normal	2,400	Wild oats	10
		Unfavorable	1,200	Ripgut brome	10
				Burclover	10
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
Rock outcrop.					
129	Shallow Granitic	Favorable	3,000	Soft chess	25
Caperton		Normal	2,000	Wild oats	15
		Unfavorable	1,000	Clover	10
				Filaree	10
				Ripgut brome	5
				Red brome	5
				Interior live oak	5
				Blue oak	5
				Manzanita	5
				Buckbrush	5

See footnotes at end of table.

TABLE 3.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
130*, 131*:					
Caperton	Shallow Granitic	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oats	15
		Unfavorable	1,000	Clover	10
				Filaree	10
				Ripgut brome	5
				Red brome	5
				Interior live oak	5
				Blue oak	5
				Manzanita	5
				Buckbrush	5
Andregg	Granitic	Favorable	3,500	Soft chess	30
		Normal	2,400	Wild oats	15
		Unfavorable	1,200	Burclover	15
				Clover	10
				Filaree	5
				Ripgut brome	5
				Scrub oak	5
				Sneezeweed	5
				Fescue	5
132*, 133*:					
Caperton	Shallow Granitic	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oats	15
		Unfavorable	1,000	Clover	10
				Filaree	10
				Ripgut brome	5
				Red brome	5
				Interior live oak	5
				Blue oak	5
				Manzanita	5
				Buckbrush	5
Rock outcrop.					
141*:					
Cometa	Claypan	Favorable	2,400	Soft chess	25
		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Wild oats	10
				Foxtail fescue	10
				Red brome	10
				Filaree	10
				Mouse barley	5
				Clover	5
				Burclover	5
				Annual lupine	5
Fiddyment	Claypan	Favorable	2,400	Soft chess	25
		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Wild oats	10
				Foxtail fescue	10
				Red brome	10
				Filaree	10
				Mouse barley	5
				Clover	5
				Burclover	5
				Annual lupine	5

See footnotes at end of table.

TABLE 3.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
144---------- Exchequer	Very Shallow Loamy----------	Favorable	2,600	Soft chess----------	15
		Normal	2,000	Chamise----------	15
		Unfavorable	1,000	Wild oats----------	10
				Scrub oak----------	10
				Ripgut brome----------	5
				Red brome----------	5
				Foxtail fescue----------	5
				Mouse barley----------	5
				Nitgrass----------	5
				Silver hairgrass----------	5
				Filaree----------	5
				Clover----------	5
				Burclover----------	5
				Blue oak----------	5
145*:					
Exchequer---------	Very Shallow Loamy----------	Favorable	2,600	Soft chess----------	15
		Normal	2,000	Chamise----------	15
		Unfavorable	1,000	Wild oats----------	10
				Scrub oak----------	10
				Ripgut brome----------	5
				Red brome----------	5
				Foxtail fescue----------	5
				Mouse barley----------	5
				Nitgrass----------	5
				Silver hairgrass----------	5
				Filaree----------	5
				Clover----------	5
				Burclover----------	5
				Blue oak----------	5
Rock outcrop.					
147*:					
Fiddyment---------	Claypan----------	Favorable	2,400	Soft chess----------	25
		Normal	1,800	Ripgut brome----------	15
		Unfavorable	1,000	Wild oats----------	10
				Foxtail fescue----------	10
				Red brome----------	10
				Filaree----------	10
				Mouse barley----------	5
				Clover----------	5
				Burclover----------	5
				Annual lupine----------	5
Kaseberg----------	Claypan----------	Favorable	2,000	Soft chess----------	25
		Normal	1,500	Ripgut brome----------	15
		Unfavorable	800	Wild oats----------	10
				Foxtail----------	10
				Mouse barley----------	10
				Red brome----------	10
				Filaree----------	10
				Clover----------	5
				Burclover----------	5
152---------- Inks	Shallow Loamy----------	Favorable	3,000	Soft chess----------	25
		Normal	2,000	Wild oats----------	10
		Unfavorable	1,000	Burclover----------	10
				Ripgut brome----------	5
				Red brome----------	5
				Foxtail fescue----------	5
				Mouse barley----------	5
				Filaree----------	5
				Clover----------	5
				Blue oak----------	5
				Interior live oak----------	5
				Whiteleaf manzanita----------	5
				Buckbrush----------	5

See footnotes at end of table.

TABLE 3.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
154*:					
Inks	Shallow Loamy	Favorable	3,000	Soft chess	25
		Normal	2,000	Wild oats	10
		Unfavorable	1,000	Burclover	10
				Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Filaree	5
				Clover	5
				Blue oak	5
				Interior live oak	5
				Whiteleaf manzanita	5
				Buckbrush	5
Exchequer	Very Shallow Loamy	Favorable	2,600	Soft chess	15
		Normal	2,000	Chamise	15
		Unfavorable	1,000	Wild oats	10
				Scrub oak	10
				Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Silver hairgrass	5
				Filaree	5
				Clover	5
				Burclover	5
				Blue oak	5
155	Loamy Foothills	Favorable	3,500	Soft chess	25
Inks variant		Normal	2,400	Wild oats	15
		Unfavorable	1,200	Ripgut brome	10
				Burclover	10
				Blue oak	10
				Foxtail fescue	5
				Mouse barley	5
				Silver hairgrass	5
				Clover	5
				Filaree	5
				Interior live oak	5
181	Claypan	Favorable	2,400	Soft chess	25
San Joaquin		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Wild oats	10
				Foxtail fescue	10
				Red brome	10
				Filaree	10
				Mouse barley	5
				Clover	5
				Burclover	5
				Annual lupine	5
182*:					
San Joaquin	Claypan	Favorable	2,400	Soft chess	25
		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Wild oats	10
				Foxtail fescue	10
				Red brome	10
				Filaree	10
				Mouse barley	5
				Clover	5
				Burclover	5
				Annual lupine	5

See footnotes at end of table.

TABLE 3.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
182*:					
Cometa	Claypan	Favorable	2,400	Soft chess	25
		Normal	1,800	Ripgut brome	15
		Unfavorable	1,000	Wild oats	10
				Foxtail fescue	10
				Red brome	10
				Filaree	10
				Mouse barley	5
				Clover	5
				Burclover	5
				Annual lupine	5
183, 184, 185	Granitic	Favorable	3,500	Soft chess	25
Sierra		Normal	2,400	Wild oats	15
		Unfavorable	1,200	Clover	10
				Filaree	10
				Blue oak	10
				Ripgut brome	5
				Red brome	5
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Interior live oak	5
191	Loamy	Favorable	3,500	Soft chess	25
Sobrante		Normal	2,400	Wild oats	10
		Unfavorable	1,200	Ripgut brome	10
				Burclover	10
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
197*	Place Diggings	Favorable	2,500	Soft chess	15
Xerorthents		Normal	2,000	Ripgut brome	15
		Unfavorable	1,000	Filaree	15
				Wild oats	5
				Clover	5
				Carex	5
				Rush	5

* See map unit description for the composition and behavior of the map unit.
** Trace.

TABLE 4.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
100, 101, 102, 103--- Aiken	1o	Slight	Slight	Slight	Moderate	Ponderosa pine---	130	Ponderosa pine.
122--- Boomer	2o	Slight	Slight	Slight	Moderate	Ponderosa pine--- Incense-cedar---	110 ---	Ponderosa pine.
123--- Boomer	2r	Slight	Slight	Slight	Moderate	Ponderosa pine--- Incense-cedar---	110 ---	Ponderosa pine.
124*: Boomer---	2r	Slight	Slight	Slight	Moderate	Ponderosa pine--- Incense-cedar---	110 ---	Ponderosa pine.
Rock outcrop.								
125*: Boomer---	2r	Moderate	Slight	Slight	Moderate	Ponderosa pine--- Douglas-fir--- Incense-cedar---	110 --- ---	Ponderosa pine.
Rock outcrop.								
126*: Boomer---	2r	Severe	Slight	Slight	Moderate	Ponderosa pine--- Douglas-fir--- Incense-cedar---	110 --- ---	Ponderosa pine.
Rock outcrop.								
127--- Boomer variant	3x	Slight	Moderate	Slight	Moderate	Ponderosa pine--- Sugar pine---	90 ---	Sugar pine.
128--- Boomer variant	4x	Moderate	Moderate	Slight	Moderate	Ponderosa pine--- Sugar pine---	80 ---	Sugar pine.
134, 135, 136--- Cohasset	1o	Slight	Slight	Slight	Moderate	Ponderosa pine--- Incense-cedar---	120 ---	Ponderosa pine.
137, 138--- Cohasset	1o	Slight	Slight	Slight	Moderate	Ponderosa pine--- Incense-cedar---	115 ---	Ponderosa pine.
139--- Cohasset	1r	Moderate	Slight	Slight	Moderate	Ponderosa pine--- Incense-cedar---	115 ---	Ponderosa pine.
143--- Dubakella	5t	Moderate	Moderate	Moderate	Moderate	Digger pine--- Ponderosa pine---	--- 60	
149, 150--- Horseshoe	1o	Slight	Slight	Slight	Moderate	Ponderosa pine--- White fir---	115 ---	Ponderosa pine.
151*: Horseshoe---	1o	Slight	Slight	Slight	Moderate	Ponderosa pine--- White fir---	115 ---	Ponderosa pine.
Rubble land.								
157, 158, 159--- Josephine	1o	Slight	Slight	Slight	Moderate	Ponderosa pine--- Douglas-fir--- Incense-cedar--- White fir--- Sugar pine---	118 --- --- --- ---	Ponderosa pine, Douglas-fir, sugar pine.

See footnote at end of table.

TABLE 4.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
160---------- Josephine	1r	Moderate	Slight	Slight	Moderate	Ponderosa pine------ Douglas-fir--------- Incense-cedar------- White fir----------- Sugar pine----------	118 --- --- --- ---	Ponderosa pine, Douglas-fir, sugar pine.
161*: Josephine--------- Rock outcrop.	1o	Slight	Slight	Slight	Moderate	Ponderosa pine------ Douglas-fir--------- Incense-cedar------- White fir----------- Sugar pine----------	118 --- --- --- ---	Ponderosa pine, Douglas-fir, sugar pine.
163---------- Mariposa	2o	Slight	Slight	Moderate	Moderate	Ponderosa pine------ Douglas-fir---------	100 ---	Ponderosa pine.
164*: Mariposa----------	2o	Slight	Slight	Moderate	Moderate	Ponderosa pine------ Douglas-fir---------	100 ---	Ponderosa pine.
Josephine---------	1o	Slight	Slight	Slight	Moderate	Ponderosa pine------ Douglas-fir--------- Incense-cedar------- White fir----------- Sugar pine----------	118 --- --- --- ---	Ponderosa pine, Douglas-fir, sugar pine.
165*: Mariposa----------	3r	Moderate	Slight	Moderate	Moderate	Ponderosa pine------ Douglas-fir---------	95 ---	Ponderosa pine.
Josephine---------	1r	Moderate	Slight	Slight	Moderate	Ponderosa pine------ Douglas-fir--------- Incense-cedar------- White fir----------- Sugar pine----------	118 --- --- --- ---	Ponderosa pine, Douglas-fir, sugar pine.
166*: Mariposa----------	3r	Severe	Slight	Moderate	Moderate	Ponderosa pine------ Douglas-fir---------	95 ---	Ponderosa pine.
Josephine---------	1r	Severe	Slight	Slight	Moderate	Ponderosa pine------ Douglas-fir--------- Incense-cedar------- White fir----------- Sugar pine----------	118 --- --- --- ---	Ponderosa pine, Douglas-fir, sugar pine.
167*: Mariposa---------- Rock outcrop.	3r	Moderate	Slight	Moderate	Moderate	Ponderosa pine------ Douglas-fir---------	95 ---	Ponderosa pine.
168*: Mariposa---------- Rock outcrop.	3r	Severe	Slight	Moderate	Moderate	Ponderosa pine------ Douglas-fir---------	95 ---	Ponderosa pine.
171---------- McCarthy	2f	Slight	Moderate	Slight	Moderate	Ponderosa pine------	105	Ponderosa pine.
172---------- McCarthy	2f	Moderate	Moderate	Slight	Moderate	Ponderosa pine------	105	Ponderosa pine.
186, 187, 188------ Sites	1o	Slight	Slight	Slight	Moderate	Ponderosa pine------ Douglas-fir---------	120 ---	Ponderosa pine.

See footnote at end of table.

TABLE 4.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
189---------- Sites	1r	Moderate	Slight	Slight	Moderate	Ponderosa pine------ Douglas-fir---------	120 ---	Ponderosa pine.
190*: Sites---------- Rock outcrop.	1r	Moderate	Slight	Slight	Moderate	Ponderosa pine------ Douglas-fir---------	120 ---	Ponderosa pine.

* See map unit description for the composition and behavior of the map unit.

TABLE 5.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
100, 101, 102---- Aiken	Fair	Good	Good	---	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
103---- Aiken	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
104*:												
Alamo----	Poor	Fair	Fair	---	---	Poor	Poor	Fair	Poor	---	Poor	Poor.
Fiddyment----	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
105---- Alamo variant	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
106, 107---- Andregg	Fair	Good	Good	Fair	---	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
108---- Andregg	Poor	Fair	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
109---- Andregg	Fair	Good	Good	Fair	---	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
110---- Andregg	Poor	Fair	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
111---- Andregg	Very poor.	Poor	Good	Fair	---	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	Good.
112*:												
Andregg----	Poor	Fair	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Rock outcrop.												
113*:												
Andregg----	Fair	Good	Good	Fair	---	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Shenandoah----	Poor	Fair	Good	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Good.
114---- Auburn	Fair	Fair	Fair	Poor	---	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
115*:												
Auburn----	Fair	Fair	Fair	Poor	---	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Argonaut----	Poor	Fair	Fair	Poor	---	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
116*:												
Auburn----	Fair	Fair	Fair	Poor	---	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Argonaut----	Poor	Fair	Fair	Poor	---	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Rock outcrop.												

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
117*:												
Auburn	Fair	Fair	Fair	Poor	---	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Rock outcrop.												
118*:												
Auburn	Fair	Fair	Fair	Poor	---	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Sobrante	Fair	Good	Good	Fair	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
119*:												
Auburn	Fair	Fair	Fair	Poor	---	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Sobrante	Fair	Good	Good	Fair	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Rock outcrop.												
120*:												
Auburn	Poor	Fair	Fair	Poor	---	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Sobrante	Poor	Fair	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Rock outcrop.												
121*:												
Auburn	Very poor.	Very poor.	Fair	Poor	---	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Fair.
Sobrante	Very poor.	Very poor.	Good	Fair	---	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	Good.
Rock outcrop.												
122--- Boomer	Fair	Good	Good	---	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
123--- Boomer	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
124*:												
Boomer	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Rock outcrop.												
125*:												
Boomer	Very poor.	Poor	Good	---	Good	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Rock outcrop.												
126*:												
Boomer	Very poor.	Very poor.	Good	---	Good	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Rock outcrop.												
127--- Boomer variant	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
128---------- Boomer variant	Very poor.	Poor	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
129---------- Caperton	Poor	Poor	Fair	Very poor.	---	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
130*:												
Caperton----------	Poor	Poor	Fair	Very poor.	---	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
Andregg----------	Fair	Good	Good	Fair	---	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
131*:												
Caperton----------	Poor	Poor	Fair	Very poor.	---	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
Andregg----------	Poor	Fair	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
132*:												
Caperton----------	Poor	Poor	Fair	Very poor.	---	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
Rock outcrop.												
133*:												
Caperton----------	Very poor.	Very poor.	Fair	Very poor.	---	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
Rock outcrop.												
134, 135---------- Cohasset	Fair	Good	Good	---	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
136---------- Cohasset	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
137---------- Cohasset	Fair	Good	Good	---	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
138---------- Cohasset	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
139---------- Cohasset	Very poor.	Poor	Good	---	Good	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
140---------- Cometa	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
141*:												
Cometa----------	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Fiddyment----------	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
142*:												
Cometa----------	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Ramona----------	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
143---------- Dubakella	Very poor.	Very poor.	Good	---	Poor	Good	Very poor.	Very poor.	Poor	Poor	Very poor.	---

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
144---------- Exchequer	Very poor.	Very poor.	Poor	Very poor.	---	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
145*: Exchequer----------	Very poor.	Very poor.	Poor	Very poor.	---	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
Rock outcrop.												
146---------- Fiddyment	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
147*: Fiddyment----------	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Kaseberg----------	Poor	Fair	Fair	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
148*: Henneke----------	Very poor.	Very poor.	Poor	---	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Rock outcrop.												
149---------- Horseshoe	Fair	Good	Good	---	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
150---------- Horseshoe	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
151*: Horseshoe----------	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Rubble land.												
152---------- Inks	Fair	Good	Poor	Very poor.	---	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Poor.
153---------- Inks	Poor	Fair	Poor	Very poor.	---	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
154*: Inks----------	Fair	Good	Poor	Very poor.	---	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Poor.
Exchequer----------	Very poor.	Very poor.	Poor	Very poor.	---	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
155---------- Inks variant	Fair	Good	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
156*: Iron Mountain-----	Very poor.	Very poor.	Poor	---	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	---
Rock outcrop.												
157, 158, 159------ Josephine	Fair	Good	Good	---	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
160---------- Josephine	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
161*: Josephine	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Rock outcrop.												
162--- Kilaga	Fair	Good	Good	---	---	Good	Poor	Fair	Good	---	Poor	Good.
163--- Mariposa	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
164*: Mariposa	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Josephine	Fair	Good	Good	---	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
165*: Mariposa	Very poor.	Poor	Good	---	Good	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Josephine	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
166*: Mariposa	Very poor.	Very poor.	Good	---	Good	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Josephine	Very poor.	Very poor.	Good	---	Good	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
167*: Mariposa	Poor	Fair	Good	---	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Rock outcrop.												
168*: Mariposa	Very poor.	Very poor.	Good	---	Good	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
Rock outcrop.												
169*, 170*: Maymen	Very poor.	Very poor.	Poor	---	---	Good	Very poor.	Very poor.	Fair	Very poor.	Very poor.	---
Rock outcrop.												
171--- McCarthy	Poor	Fair	Good	---	Fair	---	Very poor.	Very poor.	Fair	Fair	Very poor.	---
172--- McCarthy	Very poor.	Poor	Good	---	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
173*. Pits and dumps												
174, 175--- Ramona	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
176*: Redding	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Open land wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
176*: Corning	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
177*: Redding	Fair	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Corning	Fair	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
178*. Riverwash												
179*. Rock outcrop												
180*. Rubble land												
181--- San Joaquin	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
182*: San Joaquin	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Cometa	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
183, 184--- Sierra	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
185--- Sierra	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
186, 187--- Sites	Fair	Good	Good	---	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.	---
188--- Sites	Poor	Fair	Good	---	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	---
189--- Sites	Very poor.	Poor	Good	---	Good	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
190*: Sites	Very poor.	Poor	Good	---	Good	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Rock outcrop.												
191--- Sobrante	Fair	Good	Good	Fair	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
192*--- Xerofluvents	Fair	Fair	Good	---	---	Good	Poor	Poor	Fair	---	Poor	Good.
193*, 194*--- Xerofluvents	Fair	Fair	Fair	---	---	Good	Fair	Fair	Fair	---	Fair	Fair.
195*--- Xerofluvents	Fair	Fair	Fair	---	---	Poor	Fair	Fair	Fair	---	Fair	Fair.
196*. Xerorthents												
197*--- Xerorthents	Very poor.	Very poor.	Fair	Fair	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.

* See map unit description for the composition and behavior of the map unit.

TABLE 6.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
100--Aiken	Moderate: dusty.	Moderate: dusty.	Moderate: dusty, slope.	Moderate: dusty.
101--Aiken	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
102--Aiken	Moderate: slope, dusty, large stones.	Moderate: slope, dusty, large stones.	Severe: slope.	Moderate: dusty, large stones.
103--Aiken	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty, large stones.
104*: Alamo	Severe: wetness, percs slowly, floods.	Severe: wetness, too clayey.	Severe: wetness, percs slowly, too clayey.	Severe: wetness, too clayey.
Fiddyment	Moderate: percs slowly.	Slight	Moderate: slope, depth to rock, cemented pan.	Slight.
105--Alamo variant	Severe: wetness, too clayey, percs slowly.	Severe: too clayey.	Severe: slope, too clayey, percs slowly.	Severe: too clayey.
106--Andregg	Slight	Slight	Moderate: slope, depth to rock.	Slight.
107--Andregg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
108--Andregg	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
109--Andregg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
110--Andregg	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
111--Andregg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
112*: Andregg	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Rock outcrop.				
113*: Andregg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
113*:				
Shenandoah	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: slope, wetness, percs slowly.	Moderate: wetness.
114				
Auburn	Moderate: slope.	Moderate: slope.	Severe: slope, depth to rock.	Slight.
115*:				
Auburn	Moderate: slope.	Moderate: slope.	Severe: slope, depth to rock.	Slight.
Argonaut	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
116*:				
Auburn	Moderate: slope.	Moderate: slope.	Severe: slope, depth to rock.	Slight.
Argonaut	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
Rock outcrop.				
117*:				
Auburn	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
Rock outcrop.				
118*:				
Auburn	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
119*:				
Auburn	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Rock outcrop.				
120*, 121*:				
Auburn	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
122				
Boomer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
123--- Boomer	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
124*: Boomer---	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Rock outcrop.				
125*, 126*: Boomer---	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Rock outcrop.				
127--- Boomer variant	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
128--- Boomer variant	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
129--- Caperton	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
130*: Caperton---	Severe: depth to rock.	Moderate: slope.	Severe: slope, depth to rock.	Slight.
Andregg---	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
131*: Caperton---	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
Andregg---	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
132*: Caperton---	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
Rock outcrop.				
133*: Caperton---	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
134--- Cohasset	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
135--- Cohasset	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
136--- Cohasset	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
137--- Cohasset	Moderate: slope, dusty, large stones.	Moderate: slope, dusty, large stones.	Severe: slope, small stones.	Moderate: dusty, large stones.
138--- Cohasset	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty, large stones.
139--- Cohasset	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
140--- Cometa	Moderate: percs slowly.	Slight---	Moderate: slope, percs slowly.	Slight.
141*:				
Cometa---	Moderate: percs slowly.	Slight---	Moderate: slope, percs slowly.	Slight.
Fiddyment---	Moderate: percs slowly.	Slight---	Moderate: slope, depth to rock, cemented pan.	Slight.
142*:				
Cometa---	Moderate: percs slowly.	Slight---	Moderate: slope, percs slowly.	Slight.
Ramona---	Slight---	Slight---	Moderate: slope.	Slight.
143--- Dubakella	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: slope, large stones.
144--- Exchequer	Severe: depth to rock.	Moderate: slope, large stones.	Severe: slope, depth to rock, large stones.	Moderate: large stones.
145*:				
Exchequer---	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock, large stones.	Moderate: slope, large stones.
Rock outcrop.				
146--- Fiddyment	Moderate: percs slowly.	Slight---	Moderate: slope, depth to rock, cemented pan.	Slight.
147*:				
Fiddyment---	Moderate: percs slowly.	Slight---	Moderate: slope, depth to rock, cemented pan.	Slight.
Kaseberg---	Slight---	Slight---	Severe: depth to rock, cemented pan.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
148*: Henneke	Severe: slope.	Severe: slope.	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop.				
149--- Horseshoe	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: small stones, dusty.
150--- Horseshoe	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope, small stones, dusty.
151*: Horseshoe	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope, small stones, dusty.
Rubble land.				
152--- Inks	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, small stones.
153--- Inks	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.
154*: Inks	Moderate: small stones, slope.	Moderate: slope, small stones.	Severe: slope, depth to rock, small stones.	Moderate: small stones.
Exchequer	Severe: depth to rock.	Moderate: slope, large stones.	Severe: slope, depth to rock, large stones.	Moderate: large stones.
155--- Inks variant	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope, large stones.
156*: Iron Mountain	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock, large stones, slope.	Moderate: large stones, slope.
Rock outcrop.				
157--- Josephine	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty, small stones.	Moderate: dusty.
158--- Josephine	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
159--- Josephine	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
160--- Josephine	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
161*: Josephine---	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
Rock outcrop.				
162--- Kilaga	Slight---	Slight---	Slight---	Slight.
163--- Mariposa	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, small stones.
164*: Mariposa---	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, small stones.
Josephine---	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
165*, 166*: Mariposa---	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.
Josephine---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
167*, 168*: Mariposa---	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.
Rock outcrop.				
169*, 170*: Maymen---	Severe: slope.	Severe: slope.	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop.				
171--- McCarthy	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones, dusty.
172--- McCarthy	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
173*. Pits and dumps				

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
174--- Ramona	Slight	Slight	Slight	Slight.
175--- Ramona	Slight	Slight	Moderate: slope.	Slight.
176*: Redding	Moderate: small stones, percs slowly.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
Corning	Moderate: percs slowly, small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
177*: Redding	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
Corning	Moderate: slope, percs slowly, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Moderate: small stones.
178*. Riverwash				
179*. Rock outcrop				
180*. Rubble land				
181--- San Joaquin	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly, cemented pan.	Slight.
182*: San Joaquin	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly, cemented pan.	Slight.
Cometa	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight.
183--- Sierra	Slight	Slight	Moderate: slope.	Slight.
184--- Sierra	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
185--- Sierra	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
186--- Sites	Moderate: dusty.	Moderate: dusty.	Moderate: dusty, slope.	Moderate: dusty.
187--- Sites	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
188---------- Sites	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
189---------- Sites	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
190*: Sites---------- Rock outcrop.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
191---------- Sobrante	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
192*---------- Xerofluvents	Moderate: too sandy.	Moderate: too sandy.	Moderate: floods, too sandy.	Moderate: too sandy.
193*, 194*---------- Xerofluvents	Severe: wetness.	Moderate: floods, wetness.	Moderate: floods, wetness.	Moderate: wetness, floods.
195*---------- Xerofluvents	Severe: wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: wetness.
196*. Xerorthents				
197*---------- Xerorthents	Severe: large stones, floods.	Severe: large stones.	Severe: large stones, floods.	Severe: large stones.

* See map unit description for the composition and behavior of the map unit.

TABLE 7.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
100 Aiken	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Severe: low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
101 Aiken	Moderate: too clayey, slope.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.	Severe: slope.	Severe: low strength.
102 Aiken	Moderate: too clayey, large stones, slope.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.	Severe: slope.	Severe: low strength.
103 Aiken	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.	Severe: slope, low strength.
104*: Alamo	Severe: wetness, too clayey, floods.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, low strength, shrink-swell.
Fiddyment	Moderate: depth to rock, cemented pan, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
105 Alamo variant	Severe: wetness, too clayey.	Severe: wetness, shrink-swell, low strength.	Severe: wetness, shrink-swell, low strength.	Severe: slope, wetness, shrink-swell.	Severe: shrink-swell, low strength.
106 Andregg	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight.
107 Andregg	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.
108 Andregg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
109 Andregg	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.
110, 111 Andregg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
112*: Andregg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
113*: Andregg	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
113*: Shenandoah	Severe: wetness, too clayey.	Severe: wetness, low strength, shrink-swell.	Severe: wetness, low strength, shrink-swell.	Severe: slope, wetness, low strength.	Severe: low strength, shrink-swell, wetness.
114 Auburn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
115*: Auburn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
Argonaut	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
116*: Auburn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
Argonaut	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
Rock outcrop.					
117*: Auburn	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop.					
118*: Auburn	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
119*, 120*, 121*: Auburn	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
122 Boomer	Moderate: slope, small stones, too clayey.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: low strength.
123 Boomer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
124*, 125*, 126*: Boomer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Rock outcrop.					
127--- Boomer variant	Moderate: slope, too clayey.	Severe: low strength.	Severe: low strength.	Severe: slope, low strength.	Severe: low strength.
128--- Boomer variant	Severe: slope.	Severe: low strength, slope.	Severe: slope, low strength.	Severe: slope, low strength.	Severe: slope, low strength.
129--- Caperton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
130*: Caperton	Moderate: slope, depth to rock.	Moderate: slope, depth to rock.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, depth to rock.
Andregg	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.
131*: Caperton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Andregg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
132*, 133*: Caperton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
134--- Cohasset	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: low strength.
135--- Cohasset	Moderate: slope, too clayey.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: low strength.
136--- Cohasset	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
137--- Cohasset	Moderate: large stones, slope.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: low strength.
138, 139--- Cohasset	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
140--- Cometa	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
141*:					
Cometa	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Fiddyment	Moderate: depth to rock, cemented pan, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
142*:					
Cometa	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Ramona	Slight	Slight	Slight	Slight	Slight.
143 Dubakella	Severe: depth to rock, too clayey, slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, low strength.
144 Exchequer	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
145*:					
Exchequer	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop.					
146 Fiddyment	Moderate: depth to rock, cemented pan, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
147*:					
Fiddyment	Moderate: depth to rock, cemented pan, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Kaseberg	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: cemented pan, depth to rock.
148*:					
Henneke	Severe: slope, depth to rock, too clayey.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Rock outcrop.					
149 Horseshoe	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
150 Horseshoe	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
151*: Horseshoe	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Rubble land.					
152, 153--- Inks	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
154*: Inks	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: depth to rock.
Exchequer	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
155--- Inks variant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
156*: Iron Mountain	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop.					
157--- Josephine	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: low strength.
158--- Josephine	Moderate: too clayey, slope.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: low strength.
159, 160--- Josephine	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
161*: Josephine	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Rock outcrop.					
162--- Kilaga	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
163--- Mariposa	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
164*, 165*, 166*: Mariposa	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Josephine	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
167*, 168*: Mariposa	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Rock outcrop.					
169*, 170*: Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop.					
171, 172--- McCarthy	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
173*. Pits and dumps					
174--- Ramona	Slight---	Slight---	Slight---	Slight---	Slight.
175--- Ramona	Slight---	Slight---	Slight---	Moderate: slope.	Slight.
176*: Redding	Severe: cemented pan.	Severe: low strength.	Severe: cemented pan.	Severe: low strength.	Severe: low strength.
Corning	Severe: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
177*: Redding	Severe: cemented pan.	Severe: low strength.	Severe: cemented pan.	Severe: slope, low strength.	Severe: low strength.
Corning	Severe: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
178*. Riverwash					
179*. Rock outcrop					
180*. Rubble land					
181--- San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: shrink-swell, cemented pan.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
182*: San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: shrink-swell, cemented pan.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Cometa	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
183--- Sierra	Slight	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell, slope.	Moderate: low strength, shrink-swell.
184--- Sierra	Moderate: slope.	Moderate: low strength, shrink-swell, slope.	Moderate: low strength, shrink-swell, slope.	Severe: slope.	Moderate: low strength, shrink-swell, slope.
185--- Sierra	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
186--- Sites	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
187--- Sites	Moderate: slope, too clayey.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: low strength.
188, 189--- Sites	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
190*: Sites---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Rock outcrop.					
191--- Sobrante	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, low strength, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: slope, low strength, shrink-swell.
192*--- Xerofluvents	Severe: too sandy, floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.
193*, 194*--- Xerofluvents	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.
195*--- Xerofluvents	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness, cemented pan.	Severe: floods, wetness.	Moderate: wetness, floods.
196*. Xerorthents					
197*--- Xerorthents	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods.

* See map unit description for the composition and behavior of the map unit.

TABLE 8.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
100--Aiken	Severe: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
101--Aiken	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
102--Aiken	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, large stones.	Moderate: slope.	Fair: large stones, too clayey, slope.
103--Aiken	Severe: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey, large stones.	Severe: slope.	Poor: slope.
104*: Alamo	Severe: floods, cemented pan, wetness.	Severe: floods, wetness, cemented pan.	Severe: floods, wetness, cemented pan.	Severe: wetness, floods.	Poor: too clayey, wetness.
Fiddyment	Severe: depth to rock, cemented pan, percs slowly.	Moderate: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan.	Slight	Poor: thin layer, area reclaim.
105--Alamo variant	Severe: wetness, percs slowly, depth to rock.	Severe: slope, wetness.	Severe: wetness, too clayey, depth to rock.	Severe: wetness.	Poor: too clayey.
106--Andregg	Severe: depth to rock.	Severe: seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: thin layer, area reclaim.
107--Andregg	Severe: depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: thin layer, area reclaim.
108--Andregg	Severe: slope, depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
109--Andregg	Severe: depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: thin layer, area reclaim.
110--Andregg	Severe: slope, depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
111--Andregg	Severe: slope, depth to rock.	Severe: slope, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
112*:					
Andregg	Severe: slope, depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
113*:					
Andregg	Severe: depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: thin layer, area reclaim.
Shenandoah	Severe: wetness, percs slowly, depth to rock.	Severe: slope, wetness.	Severe: wetness, depth to rock.	Severe: wetness.	Poor: wetness.
114 Auburn	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
115*:					
Auburn	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
Argonaut	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Poor: too clayey, thin layer, area reclaim.
116*:					
Auburn	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
Argonaut	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Poor: too clayey, thin layer, area reclaim.
Rock outcrop.					
117*:					
Auburn	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
118*:					
Auburn	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Sobrante	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
119*:					
Auburn	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
119*:					
Sobrante	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Rock outcrop.					
120*, 121*:					
Auburn	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Sobrante	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
Rock outcrop.					
122 Boomer	Severe: depth to rock, percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: slope, too clayey, small stones.
123 Boomer	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
124*:					
Boomer	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Rock outcrop.					
125*, 126*:					
Boomer	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
Rock outcrop.					
127 Boomer variant	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: too clayey, slope.
128 Boomer variant	Severe: slope, percs slowly.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
129 Caperton	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
130*:					
Caperton	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: thin layer, area reclaim.
Andregg	Severe: depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: thin layer, area reclaim.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
131*: Caperton	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Andregg	Severe: slope, depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
132*: Caperton	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
133*: Caperton	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
134--- Cohasset	Moderate: depth to rock.	Moderate: slope, seepage.	Severe: depth to rock.	Slight---	Fair: too clayey.
135--- Cohasset	Moderate: slope, depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: slope, too clayey.
136--- Cohasset	Severe: slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
137--- Cohasset	Moderate: slope, depth to rock, large stones.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: large stones, slope.
138--- Cohasset	Severe: slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
139--- Cohasset	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
140--- Cometa	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight---	Poor: too clayey.
141*: Cometa	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight---	Poor: too clayey.
Fiddyment	Severe: depth to rock, cemented pan, percs slowly.	Moderate: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan.	Slight---	Poor: thin layer, area reclaim.
142*: Cometa	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight---	Poor: too clayey.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
142*:					
Ramona	Severe: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
143					
Dubakella	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, slope, area reclaim.
144					
Exchequer	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, large stones, area reclaim.
145*:					
Exchequer	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, large stones.
Rock outcrop.					
146					
Fiddyment	Severe: depth to rock, cemented pan, percs slowly.	Moderate: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan.	Slight	Poor: thin layer, area reclaim.
147*:					
Fiddyment	Severe: depth to rock, cemented pan, percs slowly.	Moderate: depth to rock, cemented pan, slope.	Severe: depth to rock, cemented pan.	Slight	Poor: thin layer, area reclaim.
Kaseberg	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Severe: depth to rock, cemented pan.	Slight	Poor: thin layer, area reclaim.
148*:					
Henneke	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope.	Poor: thin layer, area reclaim, slope.
Rock outcrop.					
149					
Horseshoe	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, small stones.
150					
Horseshoe	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope.	Poor: slope.
151*:					
Horseshoe	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope.	Poor: slope.
Rubble land.					
152					
Inks	Severe: slope, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: depth to rock.	Severe: slope.	Poor: slope, area reclaim, small stones.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
153---------- Inks	Severe: slope, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, area reclaim, small stones.
154*: Inks----------	Severe: depth to rock.	Severe: slope, depth to rock, small stones.	Severe: depth to rock.	Moderate: slope.	Poor: area reclaim, small stones.
Exchequer----------	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, large stones, area reclaim.
155---------- Inks variant	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
156*: Iron Mountain------	Severe: slope, depth to rock.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: thin layer, slope, area reclaim.
Rock outcrop.					
157---------- Josephine	Severe: percs slowly, depth to rock.	Moderate: slope.	Severe: depth to rock.	Slight----------	Fair: too clayey.
158---------- Josephine	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: slope, too clayey.
159---------- Josephine	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
160---------- Josephine	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
161*: Josephine----------	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Rock outcrop.					
162---------- Kilaga	Severe: percs slowly.	Slight----------	Moderate: too clayey.	Slight----------	Fair: too clayey.
163---------- Mariposa	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
164*: Mariposa----------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
164*:					
Josephine	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
165*, 166*:					
Mariposa	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Josephine	Severe: slope, percs slowly, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
167*, 168*:					
Mariposa	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
169*, 170*:					
Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
171--- McCarthy	Severe: slope, depth to rock.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, small stones, area reclaim.
172--- McCarthy	Severe: slope, depth to rock.	Severe: seepage, slope.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, small stones, area reclaim.
173*. Pits and dumps					
174--- Ramona	Severe: percs slowly.	Moderate: seepage.	Slight---	Slight---	Good.
175--- Ramona	Severe: percs slowly.	Moderate: slope, seepage.	Slight---	Slight---	Good.
176*:					
Redding	Severe: percs slowly, cemented pan.	Moderate: cemented pan, seepage, slope.	Severe: cemented pan.	Slight---	Fair: thin layer, area reclaim.
Corning	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight---	Poor: too clayey.
177*:					
Redding	Severe: percs slowly, cemented pan.	Severe: slope.	Severe: cemented pan.	Moderate: slope.	Fair: thin layer, area reclaim, slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
177*: Corning	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Poor: too clayey.
178*. Riverwash					
179*. Rock outcrop					
180*. Rubble land					
181 San Joaquin	Severe: percs slowly, cemented pan.	Moderate: seepage, cemented pan, slope.	Severe: cemented pan.	Slight	Fair: thin layer, area reclaim.
182*: San Joaquin	Severe: percs slowly, cemented pan.	Moderate: seepage, cemented pan, slope.	Severe: cemented pan.	Slight	Fair: thin layer, area reclaim.
Cometa	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: too clayey.
183 Sierra	Severe: percs slowly.	Moderate: seepage, slope.	Severe: depth to rock.	Slight	Good.
184 Sierra	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: slope.
185 Sierra	Severe: slope, percs slowly.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
186 Sites	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Fair: too clayey.
187 Sites	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Fair: too clayey, slope.
188 Sites	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope.
189 Sites	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope.
190*: Sites	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope.
Rock outcrop.					
191 Sobrante	Severe: depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer, area reclaim. slope.
192* Xerofluvents	Severe: floods, wetness.	Severe: wetness, floods, seepage.	Severe: floods, wetness, seepage.	Severe: wetness, floods, seepage.	Poor: too sandy.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
193*, 194*---------- Xerofluvents	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: thin layer, area reclaim.
195*---------- Xerofluvents	Severe: cemented pan, floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: thin layer, area reclaim.
196*. Xerorthents					
197*---------- Xerorthents	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods.	Poor: large stones.

* See map unit description for the composition and behavior of the map unit.

TABLE 9.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
100--Aiken	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
101--Aiken	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
102--Aiken	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: large stones.
103--Aiken	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
104*:				
Alamo	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
Fiddyment	Poor: low strength, thin layer, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
105--Alamo variant	Poor: shrink-swell, low strength, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
106--Andregg	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: excess fines.	Fair: area reclaim.
107--Andregg	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: excess fines.	Fair: slope, area reclaim.
108--Andregg	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: excess fines.	Poor: slope.
109--Andregg	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: excess fines.	Fair: slope, area reclaim.
110--Andregg	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: excess fines.	Poor: slope.
111--Andregg	Poor: thin layer, area reclaim, slope.	Unsuited: thin layer.	Unsuited: excess fines.	Poor: slope.
112*:				
Andregg	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
113*:				
Andregg	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: excess fines.	Fair: slope, area reclaim.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
113*:				
Shenandoah	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, area reclaim.
114	Poor:	Unsuited:	Poor:	Fair:
Auburn	thin layer, area reclaim.	excess fines.	excess fines, thin layer.	slope, thin layer.
115*:				
Auburn	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines, thin layer.	Fair: slope, thin layer.
Argonaut	Poor: shrink-swell, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
116*:				
Auburn	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines, thin layer.	Fair: slope, thin layer.
Argonaut	Poor: shrink-swell, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Rock outcrop.				
117*:				
Auburn	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines, thin layer.	Poor: slope.
Rock outcrop.				
118*:				
Auburn	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines, thin layer.	Poor: slope.
Sobrante	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
119*:				
Auburn	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines, thin layer.	Poor: slope.
Sobrante	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
120*, 121*:				
Auburn	Poor: thin layer, slope, area reclaim.	Unsuited: excess fines.	Poor: excess fines, thin layer.	Poor: slope.
Sobrante	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
120*, 121*: Rock outcrop.				
122--- Boomer	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
123--- Boomer	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
124*: Boomer---	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Rock outcrop.				
125*, 126*: Boomer---	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Rock outcrop.				
127--- Boomer variant	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: large stones, thin layer, slope.
128--- Boomer variant	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, slope.
129--- Caperton	Poor: thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim.
130*: Caperton---	Poor: thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Poor: area reclaim.
Andregg---	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: excess fines.	Fair: slope, area reclaim.
131*: Caperton---	Poor: thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim.
Andregg---	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: excess fines.	Poor: slope.
132*: Caperton---	Poor: thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim.
Rock outcrop.				
133*: Caperton---	Poor: slope, thin layer, area reclaim.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope, area reclaim.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
133*: Rock outcrop.				
134---------- Cohasset	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones.
135---------- Cohasset	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, small stones.
136---------- Cohasset	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
137---------- Cohasset	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
138---------- Cohasset	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
139---------- Cohasset	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
140---------- Cometa	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
141*: Cometa----------	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
Fiddyment----------	Poor: low strength, thin layer, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
142*: Cometa----------	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
Ramona----------	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: small stones.
143---------- Dubakella	Poor: slope, low strength, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
144---------- Exchequer	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, area reclaim.
145*: Exchequer----------	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones, area reclaim.
Rock outcrop.				
146---------- Fiddyment	Poor: low strength, thin layer, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
147*:				
Fiddyment	Poor: low strength, thin layer, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
Kaseberg	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, area reclaim.
148*:				
Henneke	Poor: thin layer, slope, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones, thin layer.
Rock outcrop.				
149--- Horseshoe	Poor: low strength.	Poor: excess fines.	Fair: excess fines.	Poor: small stones.
150--- Horseshoe	Poor: low strength.	Poor: excess fines.	Fair: excess fines.	Poor: slope, small stones.
151*:				
Horseshoe	Poor: low strength.	Poor: excess fines.	Fair: excess fines.	Poor: slope, small stones.
Rubble land.				
152--- Inks	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope, small stones.
153--- Inks	Poor: slope, thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope, small stones.
154*:				
Inks	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones.
Exchequer	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, area reclaim.
155--- Inks variant	Fair: slope, low strength, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
156*:				
Iron Mountain	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: thin layer, large stones, slope.
Rock outcrop.				
157--- Josephine	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
158--- Josephine	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, small stones.
159--- Josephine	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
160--- Josephine	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
161*: Josephine---	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
162--- Kilaga	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
163--- Mariposa	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
164*: Mariposa---	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Josephine---	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
165*, 166*: Mariposa---	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Josephine---	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
167*, 168*: Mariposa---	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Rock outcrop.				
169*, 170*: Maymen---	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones, area reclaim.
Rock outcrop.				
171--- McCarthy	Poor: thin layer, area reclaim.	Poor: excess fines, thin layer.	Poor: excess fines, thin layer.	Poor: slope, small stones.
172--- McCarthy	Poor: thin layer, slope, area reclaim.	Poor: excess fines, thin layer.	Poor: excess fines, thin layer.	Poor: slope, small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
173*. Pits and dumps				
174, 175---------- Ramona	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: small stones.
176*, 177*: Redding----------	Poor: low strength, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, area reclaim.
Corning----------	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
178*. Riverwash				
179*. Rock outcrop				
180*. Rubble land				
181---------- San Joaquin	Poor: low strength, shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim, thin layer.
182*: San Joaquin----------	Poor: low strength, shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim, thin layer.
Cometa----------	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
183---------- Sierra	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
184---------- Sierra	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
185---------- Sierra	Fair: low strength, shrink-swell, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
186---------- Sites	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones.
187---------- Sites	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, small stones.
188---------- Sites	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
189---------- Sites	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
190*: Sites	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
191--- Sobrante	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, small stones.
192*--- Xerofluvents	Good---	Fair: excess fines.	Poor: excess fines.	Poor: too sandy.
193*, 194*, 195*. Xerofluvents				
196*. Xerorthents				
197*. Xerorthents				

* See map unit description for the composition and behavior of the map unit.

TABLE 10.--WATER MANAGEMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
100--Aiken	Seepage	Hard to pack	Favorable	Favorable	Favorable	Favorable.
101--Aiken	Slope, seepage.	Hard to pack	Slope	Slope	Slope	Slope.
102--Aiken	Slope, seepage.	Hard to pack, large stones.	Slope	Slope, large stones.	Large stones, slope.	Slope, large stones.
103--Aiken	Slope, seepage.	Hard to pack, large stones.	Slope	Slope, large stones.	Slope, large stones.	Slope, large stones.
104*:						
Alamo	Cemented pan	Thin layer, hard to pack, wetness.	Cemented pan, percs slowly, floods.	Wetness, percs slowly, rooting depth.	Percs slowly, wetness.	Wetness, cemented pan, percs slowly.
Fiddyment	Cemented pan, depth to rock.	Thin layer, piping.	Cemented pan, percs slowly.	Percs slowly, rooting depth.	Cemented pan, percs slowly.	Erodes easily, depth to rock
105--Alamo variant	Depth to rock, slope.	Hard to pack, wetness, thin layer.	Percs slowly, slope.	Slope, percs slowly, wetness.	Percs slowly, wetness, slope.	Percs slowly, slope, wetness.
106--Andregg	Seepage, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Rooting depth, slope.	Favorable	Depth to rock.
107, 108--Andregg	Slope, seepage, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope	Slope, depth to rock
109--Andregg	Slope, seepage, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope	Slope, depth to rock
110, 111--Andregg	Slope, seepage, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope	Slope, depth to rock
112*:						
Andregg	Slope, seepage, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope	Slope, depth to rock
Rock outcrop.						
113*:						
Andregg	Slope, seepage, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope	Slope, depth to rock
Shenandoah	Depth to rock, slope.	Thin layer, hard to pack, wetness.	Percs slowly, depth to rock, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly, depth to rock.	Wetness, depth to rock slope.
114--Auburn	Depth to rock, slope.	Piping, thin layer.	Depth to rock, slope.	Rooting depth, slope, droughty.	Depth to rock, slope.	Slope, rooting depth droughty.
115*:						
Auburn	Depth to rock, slope.	Piping, thin layer.	Depth to rock, slope.	Rooting depth, slope, droughty.	Depth to rock, slope.	Slope, rooting depth droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
115*:						
Argonaut	Depth to rock, slope.	Hard to pack	Percs slowly, depth to rock, slope.	Percs slowly, rooting depth, slope.	Percs slowly, slope.	Slope, depth to rock, percs slowly.
116*:						
Auburn	Depth to rock, slope.	Piping, thin layer.	Depth to rock, slope.	Rooting depth, slope, droughty.	Depth to rock, slope.	Slope, rooting depth, droughty.
Argonaut	Depth to rock, slope.	Hard to pack	Percs slowly, depth to rock, slope.	Percs slowly, rooting depth, slope.	Percs slowly, slope.	Slope, depth to rock, percs slowly.
Rock outcrop.						
117*:						
Auburn	Depth to rock, slope.	Piping, thin layer.	Depth to rock, slope.	Rooting depth, slope, droughty.	Slope, depth to rock.	Slope, rooting depth, droughty.
Rock outcrop.						
118*:						
Auburn	Depth to rock, slope.	Piping, thin layer.	Depth to rock, slope.	Rooting depth, slope, droughty.	Slope, depth to rock.	Slope, rooting depth, droughty.
Sobrante	Depth to rock, slope.	Piping, thin layer.	Depth to rock, slope.	Rooting depth, slope.	Slope, depth to rock.	Slope, rooting depth.
19*, 120*, 121*:						
Auburn	Depth to rock, slope.	Piping, thin layer.	Depth to rock, slope.	Rooting depth, slope, droughty.	Slope, depth to rock.	Slope, rooting depth, droughty.
Sobrante	Depth to rock, slope.	Piping, thin layer.	Depth to rock, slope.	Rooting depth, slope.	Slope, depth to rock.	Slope, rooting depth.
Rock outcrop.						
22--- Boomer	Depth to rock, slope.	Thin layer	Slope	Slope	Slope	Slope.
23--- Boomer	Depth to rock, slope.	Thin layer	Slope	Slope	Slope	Slope.
24*, 125*, 126*:						
Boomer	Depth to rock, slope.	Thin layer	Slope	Slope	Slope	Slope.
Rock outcrop.						
27--- Boomer variant	Slope	Thin layer, hard to pack.	Slope, percs slowly.	Slope, percs slowly, large stones.	Slope, percs slowly, large stones.	Slope, percs slowly, large stones.
28--- Boomer variant	Slope	Thin layer, hard to pack, large stones.	Slope, percs slowly.	Slope, percs slowly, large stones.	Slope, percs slowly, large stones.	Slope, percs slowly, large stones.
29--- Caperton	Depth to rock, slope.	Thin layer, seepage.	Depth to rock, slope.	Slope, rooting depth, droughty.	Slope, depth to rock.	Slope, rooting depth, droughty.
30*:						
Caperton	Depth to rock, slope.	Thin layer, seepage.	Depth to rock, slope.	Slope, rooting depth, droughty.	Depth to rock, slope.	Slope, rooting depth, droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
130*: Andregg	Slope, seepage, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope	Slope, depth to rock.
131*: Caperton	Depth to rock, slope.	Thin layer, seepage.	Depth to rock, slope.	Slope, rooting depth, droughty.	Slope, depth to rock.	Slope, rooting depth, droughty.
Andregg	Slope, seepage, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope	Slope, depth to rock.
132*, 133*: Caperton	Depth to rock, slope.	Thin layer, seepage.	Depth to rock, slope.	Slope, rooting depth, droughty.	Slope, depth to rock.	Slope, rooting depth droughty.
Rock outcrop.						
134 Cohasset	Seepage	Thin layer	Favorable	Favorable	Favorable	Favorable.
135, 136 Cohasset	Seepage, slope.	Thin layer	Slope	Slope	Slope	Slope.
137 Cohasset	Seepage, slope.	Thin layer, large stones.	Slope	Large stones, slope.	Large stones, slope.	Large stones, slope.
138, 139 Cohasset	Seepage, slope.	Thin layer, large stones.	Slope	Large stones, slope.	Large stones, slope.	Large stones, slope.
140 Cometa	Favorable	Hard to pack	Percs slowly	Percs slowly	Percs slowly	Percs slowly.
141*: Cometa	Favorable	Hard to pack	Percs slowly	Percs slowly	Percs slowly	Percs slowly.
Fiddyment	Cemented pan, depth to rock.	Thin layer, piping.	Cemented pan, percs slowly.	Percs slowly, rooting depth.	Cemented pan, percs slowly.	Erodes easily, depth to rock
142*: Cometa	Favorable	Hard to pack	Percs slowly	Percs slowly	Percs slowly	Percs slowly.
Ramona	Favorable	Favorable	Favorable	Erodes easily	Favorable	Erodes easily.
143 Dubakella	Slope, depth to rock.	Large stones, thin layer, hard to pack.			Slope, depth to rock, large stones.	Slope, large stones, percs slowly.
144 Exchequer	Depth to rock, slope.	Thin layer, piping, large stones.			Slope, depth to rock, large stones.	Large stones, slope, rooting depth
145*: Exchequer	Depth to rock, slope.	Thin layer, piping, large stones.			Slope, depth to rock, large stones.	Large stones, slope, rooting depth
Rock outcrop.						
146 Fiddyment	Cemented pan, depth to rock.	Thin layer, piping.	Cemented pan, percs slowly.	Percs slowly, rooting depth.	Cemented pan, percs slowly.	Erodes easily, depth to rock
147*: Fiddyment	Cemented pan, depth to rock.	Thin layer, piping.	Cemented pan, percs slowly.	Percs slowly, rooting depth.	Cemented pan, percs slowly.	Erodes easily, depth to rock

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
147*: Kaseberg	Cemented pan, depth to rock.	Thin layer, piping.	Cemented pan, depth to rock.	Rooting depth, erodes easily.	Cemented pan, depth to rock, erodes easily.	Erodes easily, rooting depth, droughty.
148*: Henneke	Slope, depth to rock.	Thin layer	---	---	Slope, depth to rock, small stones.	Slope, rooting depth, droughty.
Rock outcrop.						
149 Horseshoe	Seepage	Seepage	Favorable	Favorable	Favorable	Favorable.
150 Horseshoe	Seepage, slope.	Seepage	Slope	Slope	Slope	Slope.
151*: Horseshoe	Seepage, slope.	Seepage	Slope	Slope	Slope	Slope.
Rubble land.						
152, 153 Inks	Depth to rock, slope.	Thin layer, piping.	Slope, depth to rock.	Rooting depth, slope.	Slope, depth to rock, small stones.	Slope, rooting depth.
154*: Inks	Depth to rock, slope.	Thin layer, piping.	Slope, depth to rock.	Rooting depth, slope.	Slope, depth to rock, small stones.	Slope, rooting depth.
Exchequer	Depth to rock, slope.	Thin layer, piping, large stones.	---	---	Slope, depth to rock, large stones.	Large stones, slope, rooting depth.
155 Inks variant	Depth to rock, seepage, slope.	Thin layer, large stones.	Slope	Large stones, slope.	Large stones, slope.	Large stones, slope.
156*: Iron Mountain	Depth to rock, seepage, slope.	Piping, thin layer, large stones.	---	---	Slope, depth to rock, large stones.	Large stones, slope, rooting depth.
Rock outcrop.						
157 Josephine	Depth to rock	Low strength, thin layer.	Favorable	Favorable	Favorable	Favorable.
158, 159, 160 Josephine	Depth to rock, slope.	Low strength, thin layer.	Slope	Slope	Slope	Slope.
161*: Josephine	Depth to rock, slope.	Low strength, thin layer.	Slope	Slope	Slope	Slope.
Rock outcrop.						
162 Kilaga	Favorable	Hard to pack	Percs slowly	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.
163 Mariposa	Seepage, depth to rock, slope.	Thin layer, seepage.	Depth to rock, slope.	Rooting depth, slope.	Slope, depth to rock.	Slope, rooting depth.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
164*, 165*, 166*: Mariposa	Seepage, depth to rock, slope.	Thin layer, seepage.	Depth to rock, slope.	Rooting depth, slope.	Slope, depth to rock.	Slope, rooting depth.
Josephine	Depth to rock, slope.	Low strength, thin layer.	Slope	Slope	Slope	Slope.
167*, 168*: Mariposa	Seepage, depth to rock, slope.	Thin layer, seepage.	Depth to rock, slope.	Rooting depth, slope.	Slope, depth to rock.	Slope, rooting depth.
Rock outcrop.						
169*, 170*: Maymen	Slope, depth to rock.	Thin layer			Slope, depth to rock.	Slope, rooting depth, droughty.
Rock outcrop.						
171, 172--- McCarthy	Seepage, depth to rock, slope.	Thin layer, seepage.	Depth to rock, slope.	Droughty, rooting depth, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
173*. Pits and dumps						
174--- Ramona	Favorable	Favorable	Favorable	Favorable	Favorable	Erodes easily.
175--- Ramona	Favorable	Favorable	Favorable	Erodes easily	Favorable	Erodes easily.
176*: Redding	Cemented pan	Thin layer, hard to pack.	Percs slowly, cemented pan.	Percs slowly, rooting depth.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
Corning	Favorable	Hard to pack	Percs slowly	Percs slowly	Percs slowly	Percs slowly.
177*: Redding	Cemented pan, slope.	Thin layer, hard to pack.	Percs slowly, cemented pan, slope.	Percs slowly, rooting depth, slope.	Cemented pan, percs slowly, slope.	Slope, cemented pan, percs slowly.
Corning	Slope	Hard to pack	Percs slowly, slope.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
178*. Riverwash						
179*. Rock outcrop						
180*. Rubble land						
181--- San Joaquin	Cemented pan	Thin layer, low strength.	Cemented pan, percs slowly.	Percs slowly, rooting depth.	Percs slowly, cemented pan.	Percs slowly, cemented pan.
182*: San Joaquin	Cemented pan	Thin layer, low strength.	Cemented pan, percs slowly.	Percs slowly, rooting depth.	Percs slowly, cemented pan.	Percs slowly, cemented pan.
Cometa	Favorable	Hard to pack	Percs slowly	Percs slowly	Percs slowly	Percs slowly.
183--- Sierra	Seepage	Favorable	Favorable	Favorable	Favorable	Favorable.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
184, 185---------- Sierra	Seepage, slope.	Favorable------	Slope----------	Slope----------	Slope----------	Slope.
186---------- Sites	Seepage--------	Hard to pack---	Favorable------	Favorable------	Favorable------	Favorable.
187, 188, 189----- Sites	Seepage, slope.	Hard to pack---	Slope----------	Slope----------	Slope----------	Slope.
190*: Sites----------	Seepage, slope.	Hard to pack---	Slope----------	Slope----------	Slope----------	Slope.
Rock outcrop.						
191---------- Sobrante	Depth to rock, slope.	Piping, thin layer.	Depth to rock, slope.	Rooting depth, slope.	Depth to rock, slope.	Slope, rooting depth.
192*---------- Xerofluvents	Seepage--------	Piping, seepage.	Floods---------	Floods, droughty.	Piping, erodes easily.	Droughty, erodes easily.
193*, 194*-------- Xerofluvents	Seepage--------	Thin layer, seepage.	Floods---------	Floods---------	Wetness--------	Wetness.
195*---------- Xerofluvents	Cemented pan---	Thin layer-----	Cemented pan, floods.	Rooting depth--	Cemented pan, wetness.	Cemented pan.
196*. Xerorthents						
197*. Xerorthents						

* See map unit description for the composition and behavior of the map unit.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
100, 101----------	0-21	Loam----------	ML	A-4, A-5	0-5	95-100	80-100	65-75	50-60	25-45	NP-10
Aiken	21-48	Clay loam-------	ML	A-6, A-7	0-10	95-100	90-100	75-95	65-80	35-50	10-20
	48-86	Clay----------	ML, MH	A-7	0-10	95-100	95-100	90-95	75-85	45-60	15-25
102, 103----------	0-21	Cobbly loam-----	ML	A-4, A-5	20-30	95-100	80-95	65-75	50-60	25-45	NP-10
Aiken	21-48	Cobbly clay loam	ML	A-6, A-7	20-30	95-100	90-100	75-95	65-80	35-50	10-20
	48-86	Cobbly clay-----	ML, MH	A-7	20-30	95-100	95-100	90-95	75-85	45-60	15-25
104*:											
Alamo----------	0-9	Clay----------	CH	A-7	0	100	100	80-95	70-85	50-60	25-35
	9-37	Clay----------	CH	A-7	0	100	100	80-95	70-85	50-60	25-35
	37	Indurated-------	---	---	---	---	---	---	---	---	---
Fiddyment---------	0-12	Loam----------	ML	A-4	0	100	95-100	95-100	60-85	20-30	NP-5
	12-28	Clay loam-------	CL	A-6, A-7	0	100	100	95-100	65-85	35-50	20-30
	28-35	Indurated-------	---	---	---	---	---	---	---	---	---
	35	Weathered bedrock.	---	---	---	---	---	---	---	---	---
105----------	0-25	Clay----------	CL, CH	A-7	0-10	95-100	90-100	80-100	70-95	40-60	20-35
Alamo variant	25-36	Sandy clay------	CL, CH	A-7	0	100	100	75-95	50-60	40-60	20-35
	36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
106, 107, 108, 109, 110, 111----------	0-29	Coarse sandy loam.	SM	A-2, A-4	0	95-100	85-95	50-60	25-45	---	NP
Andregg	29	Weathered bedrock.	---	---	---	---	---	---	---	---	---
112*:											
Andregg----------	0-29	Coarse sandy loam.	SM	A-2, A-4	0	95-100	85-95	50-60	25-45	---	NP
	29	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
113*:											
Andregg----------	0-29	Coarse sandy loam.	SM	A-2, A-4	0	95-100	85-95	50-60	25-45	---	NP
	29	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Shenandoah--------	0-16	Sandy loam------	SM	A-2	0	95-100	85-95	50-65	25-35	20-30	NP-5
	16-34	Clay, clay loam	CH, CL	A-7	0	95-100	90-100	70-85	55-80	40-60	20-35
	34	Weathered bedrock.	---	---	---	---	---	---	---	---	---
114----------	0-20	Silt loam-------	ML	A-4	0-15	95-100	75-95	70-85	50-80	20-40	NP-10
Auburn	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
115*:											
Auburn----------	0-20	Silt loam-------	ML	A-4	0-15	95-100	75-95	70-85	50-80	20-40	NP-10
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Argonaut----------	0-9	Loam----------	ML	A-4	0-5	80-100	75-95	75-90	50-80	20-40	NP-10
	9-25	Clay----------	CH	A-7	0-5	80-100	75-90	65-85	60-80	50-65	25-35
	25	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
116*:											
Auburn	0-20	Silt loam	ML	A-4	0-15	95-100	75-95	70-85	50-80	20-40	NP-10
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Argonaut	0-9	Loam	ML	A-4	0-5	80-100	75-95	75-90	50-80	20-40	NP-10
	9-25	Clay	CH	A-7	0-5	80-100	75-90	65-85	60-80	50-65	25-35
	25	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
117*:											
Auburn	0-20	Silt loam	ML	A-4	0-15	95-100	75-95	70-85	50-80	20-40	NP-10
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
118*:											
Auburn	0-20	Silt loam	ML	A-4	0-15	95-100	75-95	70-85	50-80	20-40	NP-10
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sobrante	0-16	Silt loam	ML	A-4	0	95-100	75-90	70-85	55-70	25-40	NP-10
	16-33	Loam, silt loam	CL, CL-ML	A-6, A-4	0-5	95-100	75-90	70-90	55-75	25-40	5-20
	33-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
119*, 120*, 121*:											
Auburn	0-20	Silt loam	ML	A-4	0-15	95-100	75-95	70-85	50-80	20-40	NP-10
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sobrante	0-16	Silt loam	ML	A-4	0	95-100	75-90	70-85	55-70	25-40	NP-10
	16-33	Loam, silt loam	CL, CL-ML	A-6, A-4	0-5	95-100	75-90	70-90	55-75	25-40	5-20
	33-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
122, 123	0-10	Loam	CL, CL-ML	A-4, A-6	0	85-95	75-95	70-80	50-70	25-40	5-15
Boomer	10-58	Gravelly clay loam.	CL, SC	A-6, A-7	0-5	75-85	50-75	45-70	35-60	30-50	10-25
	58	Weathered bedrock.	---	---	---	---	---	---	---	---	---
124*:											
Boomer	0-10	Loam	CL, CL-ML	A-4, A-6	0	85-95	75-95	70-80	50-70	25-40	5-15
	10-58	Gravelly clay loam.	CL, SC	A-6, A-7	0-5	75-85	50-75	45-70	35-60	30-50	10-25
	58	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
25*, 126*:											
Boomer	0-10	Gravelly loam	SC, SM-SC	A-4, A-6	0-5	75-85	50-75	40-60	35-50	25-40	5-15
	10-58	Gravelly clay loam.	CL, SC	A-6, A-7	0-5	75-85	50-75	45-70	35-60	30-50	10-25
	58	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
127---------- Boomer variant	0-11	Stony sandy loam	SM, SM-SC, SC	A-4	10-25	85-95	80-90	50-70	35-50	20-30	NP-10
	11-36	Clay loam--------	CL	A-6	0-15	95-100	95-100	75-95	65-75	30-40	15-25
	36-60	Clay------------	MH, CH	A-7	0	95-100	95-100	80-95	70-85	50-60	20-30
	60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
128---------- Boomer variant	0-11	Very stony sandy loam.	SM, SM-SC, SC	A-4	25-50	85-95	80-90	50-70	35-50	20-30	NP-10
	11-36	Clay loam--------	CL	A-6	0-15	95-100	95-100	75-95	65-75	30-40	15-25
	36-60	Clay------------	MH, CH	A-7	0	95-100	95-100	80-95	70-85	50-60	20-30
	60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
129---------- Caperton	0-18	Gravelly coarse sandy loam.	SM	A-2, A-1	0	95-100	65-75	45-65	20-30	---	NP
	18	Weathered bedrock.	---	---	---	---	---	---	---	---	---
130*, 131*: Caperton----------	0-18	Coarse sandy loam.	SM	A-2	0	95-100	65-95	50-65	20-35	---	NP
	18	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Andregg----------	0-29	Coarse sandy loam.	SM	A-2, A-4	0	95-100	85-95	50-60	25-45	---	NP
	29	Weathered bedrock.	---	---	---	---	---	---	---	---	---
132*, 133*: Caperton----------	0-18	Gravelly coarse sandy loam.	SM	A-2, A-1	0	95-100	65-75	45-65	20-30	---	NP
	18	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
134, 135, 136------ Cohasset	0-29	Loam------------	ML, CL-ML	A-4	0-5	90-100	80-95	65-80	50-65	20-30	NP-10
	29-57	Clay loam, loam	CL	A-6	5-15	90-100	75-85	70-80	50-75	30-40	15-25
	57	Weathered bedrock.	---	---	---	---	---	---	---	---	---
137, 138, 139------ Cohasset	0-29	Cobbly loam-----	SM, SC, SM-SC	A-2, A-4	25-30	80-90	65-80	40-65	30-50	10-30	NP-10
	29-57	Cobbly clay loam, cobbly loam.	SC, CL	A-6	25-50	80-90	65-80	60-80	40-60	30-40	15-25
	57	Weathered bedrock.	---	---	---	---	---	---	---	---	---
140---------- Cometa	0-18	Sandy loam------	SM, SM-SC	A-2, A-4	0	90-100	85-100	50-85	25-50	10-25	NP-10
	18-29	Clay, clay loam	CL, CH	A-7	0	95-100	95-100	70-95	50-80	40-60	20-35
	29-60	Sandy loam------	SM, SM-SC	A-2, A-4	0	95-100	85-100	50-65	25-50	10-25	NP-10
141*: Cometa----------	0-18	Sandy loam------	SM, SM-SC	A-2, A-4	0	90-100	85-100	50-85	25-50	10-25	NP-10
	18-29	Clay, clay loam clay, clay loam.	CL, CH	A-7	0	95-100	95-100	70-95	50-80	40-60	20-35
	29-60	Sandy loam------	SM, SM-SC	A-2, A-4	0	95-100	85-100	50-65	25-50	10-25	NP-10
Fiddyment---------	0-12	Loam------------	ML	A-4	0	100	95-100	95-100	60-85	20-30	NP-5
	12-28	Clay loam-------	CL	A-6, A-7	0	100	100	95-100	65-85	35-50	20-30
	28-35	Indurated-------	---	---	---	---	---	---	---	---	---
	35	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
142*:											
Cometa	0-18	Sandy loam	SM, SM-SC	A-2, A-4	0	90-100	85-100	50-85	25-50	10-25	NP-10
	18-29	Clay, clay loam	CL, CH	A-7	0	95-100	95-100	70-95	50-80	40-60	20-35
	29-60	Sandy loam	SM, SM-SC	A-2, A-4	0	95-100	85-100	50-65	25-50	10-25	NP-10
Ramona	0-6	Sandy loam	SM	A-2, A-4	0	95-100	75-95	50-60	20-40	15-25	NP-5
	6-14	Loam	ML, CL-ML	A-4	0	95-100	75-95	50-80	50-60	20-30	NP-10
	14-55	Sandy clay loam, sandy loam, loam.	SC, SM-SC	A-4, A-6	0	95-100	75-95	50-75	35-50	25-40	5-15
	55-73	Gravelly sandy loam, gravelly coarse sandy loam.	SM, SM-SC	A-1, A-2, A-4	0	60-80	50-75	30-65	15-50	15-35	NP-10
143	0-17	Very stony loam	SC, SM-SC	A-6, A-4	40-55	80-95	65-85	60-70	40-50	25-40	5-15
Dubakella	17-31	Cobbly clay	CL, CH	A-6, A-7	15-40	90-95	80-90	60-70	50-60	40-55	20-35
	21-38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
144	0-11	Very stony loam	ML	A-4	25-50	80-90	70-80	60-75	50-60	20-35	NP-10
Exchequer	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
145*:											
Exchequer	0-11	Very stony loam	ML	A-4	25-50	80-90	70-80	60-75	50-60	20-35	NP-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
146	0-12	Loam	ML	A-4	0	100	95-100	95-100	60-85	20-30	NP-5
Fiddyment	12-28	Clay loam	CL	A-6, A-7	0	100	100	95-100	65-85	35-50	20-30
	28-35	Indurated	---	---	---	---	---	---	---	---	---
	35	Weathered bedrock.	---	---	---	---	---	---	---	---	---
147*:											
Fiddyment	0-12	Loam	ML	A-4	0	100	95-100	95-100	60-85	20-30	NP-5
	12-28	Clay loam	CL	A-6, A-7	0	100	100	95-100	65-85	35-50	20-30
	28-35	Indurated	---	---	---	---	---	---	---	---	---
	35	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Kaseberg	0-16	Loam	ML	A-4	0	100	95-100	95-100	60-85	25-35	NP-5
	16-17	Indurated	---	---	---	---	---	---	---	---	---
	17	Weathered bedrock.	---	---	---	---	---	---	---	---	---
148*:											
Henneke	0-3	Gravelly loam	GM-GC, SM-SC, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	3-18	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	0-30	50-60	30-50	25-50	20-40	40-60	15-30
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
149, 150---------- Horseshoe	0-28	Gravelly loam---	SC, SM-SC, GC, GM-GC	A-2, A-4, A-6	0-10	60-90	55-75	45-70	30-50	20-35	5-20
	28-74	Gravelly clay loam.	SC, CL	A-6, A-7	0-10	70-95	60-75	50-75	35-65	30-50	10-25
151*: Horseshoe---------	0-28	Gravelly loam---	SC, SM-SC, GC, GM-GC	A-2, A-4, A-6	0-10	60-90	55-75	45-70	30-50	20-35	5-20
	28-74	Gravelly clay loam.	SC, CL	A-6, A-7	0-10	70-95	60-75	50-75	35-65	30-50	10-25
Rubble land.											
152, 153---------- Inks	0-5	Cobbly loam-----	GM, SM, GM-GC, SM-SC	A-2, A-4	25-35	60-80	55-75	40-65	25-50	15-30	NP-10
	5-18	Very cobbly clay loam, very cobbly loam.	GC, SC	A-6	25-55	55-75	50-75	45-70	35-50	20-40	10-20
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
154*: Inks----------	0-5	Cobbly loam-----	GM, SM, GM-GC, SM-SC	A-2, A-4	25-35	60-80	55-75	40-65	25-50	15-30	NP-10
	5-18	Very cobbly clay loam, very cobbly loam.	GC, SC	A-6	25-55	55-75	50-75	45-70	35-50	20-40	10-20
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Exchequer---------	0-11	Very stony loam	ML	A-4	25-50	80-90	70-80	60-75	50-60	20-35	NP-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
155---------- Inks variant	0-17	Cobbly loam-----	SM	A-4	25-35	75-90	75-85	55-65	35-50	25-40	NP-10
	17-51	Very cobbly clay loam.	SC	A-6	40-50	75-85	70-80	55-65	35-50	30-40	10-20
	51	Weathered bedrock.	---	---	---	---	---	---	---	---	---
156*: Iron Mountain-----	0-17	Cobbly sandy loam.	SM	A-2, A-1	25-35	70-85	70-80	40-55	20-35	20-35	NP-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
157, 158, 159, 160- Josephine	0-11	Loam----------	ML	A-4	0	80-95	75-90	65-85	55-70	25-40	NP-10
	11-36	Clay loam, silty clay loam.	ML	A-6, A-7	0	80-95	75-90	70-90	60-85	35-50	10-20
	36-52	Silty clay loam	SM, ML	A-6, A-7	0-10	45-90	40-85	40-80	35-60	35-50	10-20
	52	Weathered bedrock.	---	---	---	---	---	---	---	---	---
161*: Josephine---------	0-11	Loam----------	ML	A-4	0	80-95	75-90	65-85	55-70	25-40	NP-10
	11-36	Clay loam, silty clay loam.	ML	A-6, A-7	0	80-95	75-90	70-90	60-85	35-50	10-20
	36-52	Silty clay loam	SM, ML	A-6, A-7	0-10	45-90	40-85	40-80	35-60	35-50	10-20
	52	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
161*: Rock outcrop.											
162---------- Kilaga	0-19	Loam----------	ML, CL-ML	A-4	0	100	95-100	85-95	60-75	15-30	NP-10
	19-30	Clay loam-------	CL	A-6	0	100	95-100	85-95	65-80	30-40	10-20
	30-56	Clay, sandy clay, clay loam.	CL, CH	A-6, A-7	0	100	95-100	85-95	50-85	35-55	15-30
	56-83	Sandy clay loam	SC, SM-SC, CL, CL-ML	A-4, A-6	0	95-100	85-100	80-90	45-55	25-35	5-15
163---------- Mariposa	0-6	Gravelly loam---	SM, GM	A-2, A-4	0-5	65-85	60-75	40-60	30-45	20-40	NP-10
	6-28	Gravelly loam, gravelly silt loam, gravelly clay loam.	SM-SC, SC, GC, GM-GC	A-2, A-4, A-6	0-5	65-85	55-75	40-60	30-45	20-40	5-15
	28	Weathered bedrock.	---	---	---	---	---	---	---	---	---
164*, 165*, 166*: Mariposa----------	0-6	Gravelly loam---	SM, GM	A-2, A-4	0-5	65-85	60-75	40-60	30-45	20-40	NP-10
	6-28	Gravelly loam, gravelly silt loam, gravelly clay loam.	SM-SC, SC, GC, GM-GC	A-2, A-4, A-6	0-5	65-85	55-75	40-60	30-45	20-40	5-15
	28	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Josephine---------	0-11	Loam----------	ML	A-4	0	80-95	75-90	65-85	55-70	25-40	NP-10
	11-36	Clay loam, silty clay loam.	ML	A-6, A-7	0	80-95	75-90	70-90	60-85	35-50	10-20
	36-52	Silty clay loam	SM, ML	A-6, A-7	0-10	45-90	40-85	40-80	35-60	35-50	10-20
	52	Weathered bedrock.	---	---	---	---	---	---	---	---	---
167*, 168*: Mariposa----------	0-6	Gravelly loam---	SM, GM	A-2, A-4	0-5	65-85	60-75	40-60	30-45	20-40	NP-10
	6-28	Gravelly loam, gravelly silt loam, gravelly clay loam.	SM-SC, SC, GC, GM-GC	A-2, A-4, A-6	0-5	65-85	55-75	40-60	30-45	20-40	5-15
	28	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
169*, 170*: Maymen----------	0-12	Gravelly loam---	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	15-30	NP-5
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
171, 172---------- McCarthy	0-13	Cobbly sandy loam	GM, SM	A-2, A-4	25-40	65-75	60-75	35-55	30-45	25-35	NP-5
	13-39	Very cobbly sandy loam.	GM	A-2, A-1	25-40	40-70	40-70	25-50	15-35	25-35	NP-5
	39	Weathered bedrock.	---	---	---	---	---	---	---	---	---
173*. Pits and dumps											

See footnote at end of table.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
174, 175---------- Ramona	0-6	Sandy loam------	SM	A-2, A-4	0	95-100	75-95	50-60	20-40	15-25	NP-5
	6-14	Loam------------	ML, CL-ML	A-4	0	95-100	75-95	50-80	50-60	20-30	NP-10
	14-55	Sandy clay loam, sandy loam, loam.	SC, SM-SC	A-4, A-6	0	95-100	75-95	50-75	35-50	25-40	5-15
	55-73	Gravelly sandy loam, gravelly coarse sandy loam.	SM, SM-SC	A-1, A-2, A-4	0	60-80	50-75	30-65	15-50	15-35	NP-10
176*, 177*: Redding-----------	0-14	Gravelly loam---	SC, SM-SC, GC, GM-GC	A-4, A-6	0-15	65-90	60-75	55-70	35-50	20-35	5-15
	14-28	Clay, clay loam	CH, CL	A-7	0-5	80-95	75-90	70-90	60-75	40-60	15-35
	28	Indurated-------	---	---	---	---	---	---	---	---	---
Corning-----------	0-22	Gravelly loam---	SM, SM-SC	A-4	0-5	75-90	60-75	60-70	40-50	20-35	5-10
	22-36	Clay, clay loam	CL, CH	A-7	0-5	80-100	75-85	65-85	55-70	40-60	20-35
	36-40	Gravelly clay loam, gravelly clay.	SC, CL, GC, CH	A-7	0-5	70-80	60-75	55-75	40-60	40-60	20-35
	40-58	Gravelly sandy clay loam.	SC, SM-SC	A-2	0-5	60-75	50-75	35-60	20-35	20-35	5-15
178*. Riverwash											
179*. Rock outcrop											
180*. Rubble land											
181---------- San Joaquin	0-15	Sandy loam------	SM	A-4	0	95-100	95-100	65-85	35-50	15-25	NP-5
	15-35	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	35-50	Indurated-------	---	---	---	---	---	---	---	---	---
	50-60	Stratified sandy loam to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
182*: San Joaquin-------	0-15	Sandy loam------	SM	A-4	0	95-100	90-100	65-85	35-50	15-25	NP-5
	15-35	Clay loam, clay	CL	A-7	0	95-100	95-100	80-95	55-70	40-50	25-35
	35-50	Indurated-------	---	---	---	---	---	---	---	---	---
	50-60	Stratified sandy loam to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
Cometa------------	0-18	Sandy loam------	SM, SM-SC	A-2, A-4	0	90-100	85-100	50-85	25-50	10-25	NP-10
	18-29	Clay, clay loam	CL, CH	A-7	0	95-100	95-100	70-95	50-80	40-60	20-35
	29-60	Sandy loam------	SM, SM-SC	A-2, A-4	0	95-100	85-100	50-65	25-50	10-25	NP-10
183, 184, 185------ Sierra	0-23	Sandy loam------	SM	A-4	0	95-100	90-100	60-75	35-50	25-35	NP-5
	23-41	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	65-80	35-70	30-45	10-20
	41	Weathered bedrock.	---	---	---	---	---	---	---	---	---
186, 187, 188, 189- Sites	0-16	Loam------------	ML	A-4	0-5	90-100	80-95	60-75	50-65	20-40	NP-10
	16-26	Clay loam-------	CL	A-6	0-5	90-100	85-95	65-75	55-70	30-40	10-20
	26-65	Clay, clay loam	MH, ML	A-7	0	90-100	85-95	75-90	70-85	45-60	15-25
	65	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
190*:											
Sites	0-16	Loam	ML	A-4	0-5	90-100	80-95	60-75	50-65	20-40	NP-10
	16-26	Clay loam	CL	A-6	0-5	90-100	85-95	65-75	55-70	30-40	10-20
	26-65	Clay, clay loam	MH, ML	A-7	0	90-100	85-95	75-90	70-85	45-60	15-25
	65	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
191	0-16	Silt loam	ML	A-4	0	95-100	75-90	70-85	55-70	25-40	NP-10
Sobrante	16-33	Loam, clay loam	CL, CL-ML	A-6, A-4	0-5	95-100	75-90	70-90	55-75	25-40	5-20
	33-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
192*	0-60	Stratified sand and loamy sand.	SP-SM, SM	A-1, A-2, A-3	0	90-100	80-100	40-60	5-30	---	NP
Xerofluvents											
193*, 194*	0-60	Variable	---	---	---	---	---	---	---	---	---
Xerofluvents											
195*	0-40	Variable	---	---	---	---	---	---	---	---	---
Xerofluvents	40	Indurated	---	---	---	---	---	---	---	---	---
196*, 197*	0-60	Variable	---	---	---	---	---	---	---	---	---
Xerorthents											

* See map unit description for the composition and behavior of the map unit.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
100,101---- Aiken	0-21	0.6-2.0	0.14-0.17	5.6-6.5	Low----	0.20	5
	21-48	0.6-2.0	0.16-0.18	4.5-6.0	Moderate----	0.28	
	48-86	0.2-0.6	0.15-0.17	4.5-6.0	Moderate----	0.28	
102, 103---- Aiken	0-21	0.6-2.0	0.13-0.16	5.6-6.5	Low----	0.17	5
	21-48	0.6-2.0	0.14-0.17	5.6-6.0	Moderate----	0.28	
	48-86	0.2-0.6	0.14-0.16	4.5-6.0	Moderate----	0.28	
104*:							
Alamo----	0-9	0.06-0.2	0.13-0.16	6.1-7.3	High----	0.24	2
	9-37	<0.06	0.12-0.15	6.6-8.4	High----	0.24	
	37	---	---	---	----	---	
Fiddyment----	0-12	0.6-2.0	0.14-0.17	5.1-6.0	Low----	0.43	1
	12-28	<0.06	0.04-0.06	6.1-7.3	High----	0.43	
	28-35	---	---	---	----	---	
	35	---	---	---	----	---	
105---- Alamo variant	0-25	0.06-0.2	0.13-0.16	6.1-7.3	High----	0.24	2
	25-36	<0.06	0.13-0.16	7.4-8.4	High----	0.24	
	36	---	---	---	----	---	
106, 107, 108, 109, 110, 111---- Andregg	0-29	2.0-6.0	0.10-0.13	5.6-7.3	Low----	0.24	2
	29	---	---	---	----	---	
112*:							
Andregg----	0-29	2.0-6.0	0.10-0.13	5.6-7.3	Low----	0.24	2
	29	---	---	---	----	---	
Rock outcrop.							
113*:							
Andregg----	0-29	2.0-6.0	0.10-0.13	5.6-7.3	Low----	0.24	2
	29	---	---	---	----	---	
Shenandoah----	0-16	0.6-2.0	0.11-0.13	5.1-6.0	Low----	0.24	3
	16-34	<0.06	0.12-0.16	5.1-6.0	High----	0.32	
	34	---	---	---	----	---	
114---- Auburn	0-20	0.6-2.0	0.14-0.17	5.6-6.5	Low----	0.32	1
	20	---	---	---	----	---	
115*:							
Auburn----	0-20	0.6-2.0	0.14-0.17	5.6-6.5	Low----	0.32	1
	20	---	---	---	----	---	
Argonaut----	0-9	0.6-2.0	0.14-0.17	5.6-6.5	Low----	0.32	2
	9-25	0.06-2.0	0.10-0.16	6.1-7.3	High----	0.28	
	25	---	---	---	----	---	
116*:							
Auburn----	0-20	0.6-2.0	0.14-0.17	5.6-6.5	Low----	0.32	1
	20	---	---	---	----	---	
Argonaut----	0-9	0.6-2.0	0.14-0.17	5.6-6.5	Low----	0.32	2
	9-25	0.06-0.2	0.10-0.16	6.1-7.3	High----	0.28	
	25	---	---	---	----	---	
Rock outcrop.							

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
117*:							
Auburn	0-20	0.6-2.0	0.14-0.17	5.6-6.5	Low	0.32	1
	20	---	---	---	---	---	
Rock outcrop.							
118*:							
Auburn	0-20	0.6-2.0	0.14-0.17	5.6-6.5	Low	0.32	1
	20	---	---	---	---	---	
Sobrante	0-16	0.6-2.0	0.13-0.17	5.6-6.5	Low	0.32	2
	16-33	0.6-2.0	0.13-0.18	5.6-6.5	Moderate	0.32	
	33-40	---	---	---	---	---	
	40	---	---	---	---	---	
119*, 120*, 121*:							
Auburn	0-20	0.6-2.0	0.14-0.17	5.6-6.5	Low	0.32	1
	20	---	---	---	---	---	
Sobrante	0-16	0.6-2.0	0.13-0.17	5.6-6.5	Low	0.32	2
	16-33	0.6-2.0	0.13-0.18	5.6-6.5	Moderate	0.32	
	33-40	---	---	---	---	---	
	40	---	---	---	---	---	
Rock outcrop.							
122, 123	0-10	0.6-2.0	0.13-0.16	5.6-6.5	Low	0.32	3
Boomer	10-58	0.2-0.6	0.12-0.15	5.6-6.0	Moderate	0.24	
	58	---	---	---	---	---	
124*:							
Boomer	0-10	0.6-2.0	0.13-0.16	5.6-6.5	Low	0.32	3
	10-58	0.2-0.6	0.12-0.15	5.6-6.0	Moderate	0.24	
	58	---	---	---	---	---	
Rock outcrop.							
125*, 126*:							
Boomer	0-10	0.6-2.0	0.11-0.15	5.6-6.5	Low	0.28	3
	10-58	0.2-0.6	0.12-0.15	5.6-6.0	Moderate	0.24	
	58	---	---	---	---	---	
Rock outcrop.							
127	0-11	0.6-2.0	0.10-0.13	5.6-6.5	Low	0.28	3
Boomer variant	11-36	0.2-0.6	0.16-0.18	5.1-6.0	Moderate	0.28	
	36-60	0.06-0.2	0.12-0.15	5.1-6.0	Moderate	0.28	
	60	---	---	---	---	---	
128	0-11	0.6-2.0	0.08-0.12	5.6-6.5	Low	0.28	3
Boomer variant	11-36	0.2-0.6	0.16-0.18	5.1-6.0	Moderate	0.28	
	36-60	0.06-0.2	0.12-0.15	5.1-6.0	Moderate	0.28	
	60	---	---	---	---	---	
129	0-18	2.0-6.0	0.08-0.11	5.6-6.5	Low	0.20	1
Caperton	18	---	---	---	---	---	
130*, 131*:							
Caperton	0-18	2.0-6.0	0.10-0.12	5.6-6.5	Low	0.20	1
	18	---	---	---	---	---	
Andregg	0-29	2.0-6.0	0.10-0.13	5.6-7.3	Low	0.24	2
	29	---	---	---	---	---	
132*, 133*:							
Caperton	0-18	2.0-6.0	0.08-0.11	5.6-6.5	Low	0.20	1
	18	---	---	---	---	---	

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
132*, 133*: Rock outcrop.							
134, 135, 136---------- Cohasset	0-29	0.6-2.0	0.13-0.16	5.6-6.5	Low----------	0.20	3
	29-57	0.6-2.0	0.12-0.17	4.5-6.0	Moderate------	0.28	
	57	---	---	---	----------	---	
137, 138, 139---------- Cohasset	0-29	0.6-2.0	0.11-0.15	5.6-6.5	Low----------	0.17	3
	29-57	0.6-2.0	0.11-0.16	4.5-6.0	Moderate------	0.28	
	57	---	---	---	----------	---	
140---------- Cometa	0-18	0.6-2.0	0.10-0.13	5.6-6.5	Low----------	0.32	2
	18-29	<0.06	0.04-0.06	6.1-7.3	High----------	0.24	
	29-60	0.06-0.2	0.06-0.10	6.6-7.3	Low----------	0.28	
141*: Cometa----------	0-18	0.6-2.0	0.10-0.13	5.6-6.5	Low----------	0.32	2
	18-29	<0.06	0.04-0.06	6.1-7.3	High----------	0.24	
	29-60	0.06-0.2	0.09-0.11	6.6-7.3	Low----------	0.28	
Fiddyment----------	0-12	0.6-2.0	0.14-0.17	5.1-6.0	Low----------	0.43	1
	12-28	<0.06	0.04-0.06	6.1-7.3	High----------	0.43	
	28-35	---	---	---	----------	---	
	35	---	---	---	----------	---	
142*: Cometa----------	0-18	0.06-2.0	0.10-0.13	5.6-6.5	Low----------	0.32	2
	18-29	<0.06	0.04-0.06	6.1-7.3	High----------	0.24	
	29-60	0.06-0.2	0.09-0.11	6.6-7.3	Low----------	0.28	
Ramona----------	0-6	0.6-2.0	0.09-0.11	5.6-6.5	Low----------	0.32	5
	6-14	0.6-2.0	0.10-0.15	5.6-6.5	Low----------	0.37	
	14-55	0.2-0.6	0.12-0.17	6.1-7.3	Low----------	0.32	
	55-73	0.2-0.6	0.05-0.10	6.6-7.3	Low----------	0.28	
143---------- Dubakella	0-17	0.6-2.0	0.09-0.12	6.1-7.3	Moderate------	0.24	2
	17-31	0.06-0.2	0.11-0.13	6.1-7.8	Moderate------	0.24	
	31-38	---	---	---	----------	---	
	38	---	---	---	----------	---	
144---------- Exchequer	0-11	0.6-2.0	0.09-0.13	5.6-6.5	Low----------	0.24	1
	11	---	---	---	----------	---	
145*: Exchequer----------	0-11	0.6-2.0	0.01-0.13	5.6-6.5	Low----------	0.24	1
	11	---	---	---	----------	---	
Rock outcrop.							
146---------- Fiddyment	0-12	0.6-2.0	0.14-0.17	5.1-6.0	Low----------	0.43	1
	12-28	<0.06	0.04-0.06	6.1-7.3	High----------	0.43	
	28-35	---	---	---	----------	---	
	35	---	---	---	----------	---	
147*: Fiddyment----------	0-12	0.6-2.0	0.14-0.17	5.1-6.0	Low----------	0.43	1
	12-28	<0.06	0.04-0.06	6.1-7.3	High----------	0.43	
	28-35	---	---	---	----------	---	
	35	---	---	---	----------	---	
Kaseberg----------	0-16	0.6-2.0	0.14-0.17	5.6-6.5	Low----------	0.43	1
	16-17	---	---	---	----------	---	
	17	---	---	---	----------	---	

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
148*:							
Henneke	0-3	0.6-2.0	0.08-0.12	6.1-6.5	Moderate	0.28	1
	3-18	0.2-0.6	0.06-0.09	6.6-7.3	Moderate	0.24	
	18	---	---	---	---	---	
Rock outcrop.							
149, 150	0-28	0.6-2.0	0.12-0.15	5.6-6.5	Low	0.20	5
Horseshoe	28-74	0.6-2.0	0.13-0.16	4.5-5.5	Moderate	0.24	
151*:							
Horseshoe	0-28	0.6-2.0	0.12-0.15	5.6-6.5	Low	0.20	5
	28-74	0.6-2.0	0.13-0.16	4.5-5.5	Moderate	0.24	
Rubble land.							
152, 153	0-5	0.6-2.0	0.07-0.12	5.6-6.5	Low	0.20	1
Inks	5-18	0.6-2.0	0.08-0.12	5.6-6.5	Low	0.24	
	18	---	---	---	---	---	
154*:							
Inks	0-5	0.6-2.0	0.07-0.12	5.6-6.5	Low	0.20	1
	5-18	0.6-2.0	0.08-0.12	5.6-6.5	Low	0.24	
	18	---	---	---	---	---	
Exchequer	0-11	0.6-2.0	0.09-0.13	5.6-6.5	Low	0.24	1
	11	---	---	---	---	---	
155	0-17	0.6-2.0	0.09-0.12	5.6-6.5	Low	0.17	2
Inks variant	17-51	0.6-2.0	0.08-0.12	5.6-6.5	Low	0.20	
	51	---	---	---	---	---	
156*:							
Iron Mountain	0-17	2.0-6.0	0.05-0.09	5.6-6.5	Low	0.20	1
	17	---	---	---	---	---	
Rock outcrop.							
157, 158, 159, 160	0-11	0.6-2.0	0.12-0.18	5.6-6.5	Low	0.24	3
Josephine	11-36	0.2-0.6	0.14-0.19	5.1-6.0	Moderate	0.37	
	36-52	0.2-0.6	0.10-0.19	5.1-6.0	Moderate	0.32	
	52	---	---	---	---	---	
161*:							
Josephine	0-11	0.6-2.0	0.12-0.18	5.6-6.5	Low	0.24	3
	11-36	0.2-0.6	0.14-0.19	5.1-6.0	Moderate	0.37	
	36-52	0.2-0.6	0.10-0.19	5.1-6.0	Moderate	0.32	
	52	---	---	---	---	--	
Rock outcrop.							
162	0-19	0.6-2.0	0.13-0.16	5.6-6.5	Low	0.43	5
Kilaga	19-30	0.2-0.6	0.16-0.18	6.6-7.8	Moderate	0.37	
	30-56	0.06-0.2	0.13-0.17	6.6-8.4	High	0.20	
	56-83	0.2-0.6	0.15-0.17	6.6-8.4	Moderate	0.24	
163	0-6	0.6-2.0	0.09-0.14	5.6-6.5	Low	0.28	2
Mariposa	6-28	0.6-2.0	0.10-0.14	4.5-6.0	Low	0.32	
	28	---	---	---	---	---	
164*, 165*, 166*:							
Mariposa	0-6	0.6-2.0	0.09-0.14	5.6-6.5	Low	0.28	2
	6-28	0.6-2.0	0.10-0.14	4.5-6.0	Low	0.32	
	28	---	---	---	---	---	
Josephine	0-11	0.6-2.0	0.12-0.18	5.6-6.5	Low	0.24	3
	11-36	0.2-0.6	0.14-0.19	5.1-6.0	Moderate	0.37	
	36-52	0.2-0.6	0.10-0.19	5.1-6.0	Moderate	0.32	
	52	---	---	---	---	---	

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
167*, 168*:							
Mariposa	0-6	0.6-2.0	0.09-0.14	5.6-6.5	Low	0.28	2
	6-28	0.6-2.0	0.10-0.14	4.5-6.0	Low	0.32	
	28	---	---	---	---	---	
Rock outcrop.							
169*, 170*:							
Maymen	0-12	0.6-2.0	0.08-0.14	5.1-6.0	Low	0.28	1
	12	---	---	---	---	---	
Rock outcrop.							
171, 172	0-13	2.0-6.0	0.08-0.10	5.6-6.5	Low	0.10	2
McCarthy	13-39	2.0-6.0	0.06-0.09	5.1-6.0	Low	0.10	
	39	---	---	---	---	---	
173*.							
Pits and dumps							
174, 175	0-6	0.6-2.0	0.09-0.11	5.6-6.5	Low	0.32	5
Ramona	6-14	0.6-2.0	0.10-0.15	5.6-6.5	Low	0.37	
	14-55	0.2-0.6	0.12-0.17	6.1-7.3	Moderate	0.32	
	55-73	0.2-0.6	0.05-0.10	6.6-7.3	Low	0.28	
176*, 177*:							
Redding	0-14	0.6-2.0	0.10-0.14	5.1-6.0	Low	0.20	2
	14-28	<0.06	0.04-0.04	4.5-6.0	Moderate	0.28	
	28	---	---	---	---	---	
Corning	0-22	0.6-2.0	0.10-0.14	5.1-6.0	Low	0.20	2
	22-36	<0.06	0.04-0.06	4.5-5.5	High	0.28	
	36-40	<0.06	0.04-0.06	4.5-5.5	High	0.28	
	40-58	0.06-0.2	0.06-0.12	5.1-6.0	Low	0.20	
178*.							
Riverwash							
179*.							
Rock outcrop							
180*.							
Rubble land							
181	0-15	0.06-2.0	0.10-0.13	5.6-6.5	Low	0.32	2
San Joaquin	15-35	<0.06	0.04-0.06	5.6-7.8	High	0.24	
	35-50	---	---	---	---	---	
	50-60	0.06-0.2	0.10-0.12	6.1-7.8	Low	0.32	
182*:							
San Joaquin	0-15	0.6-2.0	0.10-0.13	5.6-6.5	Low	0.32	2
	15-35	<0.06	0.04-0.06	5.6-7.8	Low	0.24	
	35-50	---	---	---	---	---	
	50-60	0.06-0.2	0.10-0.12	6.1-7.8	Low	0.32	
Cometa	0-18	0.6-2.0	0.10-0.13	5.6-6.5	Low	0.32	2
	18-29	<0.06	0.04-0.06	6.1-7.3	High	0.24	
	29-60	0.2-0.6	0.09-0.11	6.6-7.3	Low	0.28	
183, 184, 185	0-23	0.6-2.0	0.10-0.12	5.6-7.3	Low	0.28	3
Sierra	23-41	0.2-0.6	0.15-0.18	5.6-6.5	Moderate	0.32	
	41	---	---	---	---	---	

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
186, 187, 188, 189-----	0-16	0.6-2.0	0.14-0.17	5.6-6.5	Low----------	0.28	5
Sites	16-26	0.6-2.0	0.16-0.18	4.5-6.0	Moderate------	0.28	
	26-65	0.2-0.6	0.13-0.16	4.5-6.0	Moderate------	0.28	
	65	---	---	---	----------	---	
190*:							
Sites-----------	0-16	0.6-2.0	0.14-0.17	5.6-6.5	Low----------	0.28	5
	16-26	0.6-2.0	0.16-0.18	4.5-6.0	Moderate------	0.28	
	26-65	0.2-0.6	0.13-0.16	4.5-6.0	Moderate------	0.28	
	65	---	---	---	----------	---	
Rock outcrop.							
191-----------	0-16	0.6-2.0	0.13-0.17	5.6-6.5	Low----------	0.32	2
Sobrante	16-33	0.6-2.0	0.13-0.18	5.6-6.5	Moderate------	0.32	
	33-40	---	---	---	----------	---	
	40	---	---	---	----------	---	
192*-----------	0-60	2.0-20	0.04-0.09	6.1-7.8	Low----------	0.10	5
Xerofluvents							
193*, 194*-----	0-60	---	---	---	----------	---	
Xerofluvents							
195*-----------	0-40	---	---	---	----------	---	
Xerofluvents	40	---	---	---	----------	---	
196*, 197*-----	0-60	---	---	---	----------	---	
Xerorthents							

* See map unit description for the composition and behavior of the map unit.

TABLE 13.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "ap
The symbol < means less than; > means more than. Absence of an entry indicates that the feature is no

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cement pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Ha
					Ft			In		In	
100, 101, 102, 103---------- Aiken	B	None--------	---	---	>6.0	---	---	>60	---	---	-
104*: Alamo----------	D	Occasional	Long------	Dec-Apr	0-1.0	Perched	Dec-Apr	>60	---	20-40	Ri p
Fiddyment--------	D	None--------	---	---	>6.0	---	---	21-38	Rippable	20-37	Ri p
105---------- Alamo variant	D	None--------	---	---	1.0-2.5	Apparent	Dec-Apr	36-60	Rippable	---	-
106, 107, 108, 109, 110, 111---- Andregg	C	None--------	---	---	>6.0	---	---	24-40	Rippable	---	-
112*: Andregg----------	C	None--------	---	---	>6.0	---	---	24-40	Rippable	---	-
Rock outcrop.											
113*: Andregg----------	C	None--------	---	---	>6.0	---	---	24-40	Rippable	---	-
Shenandoah-------	D	None--------	---	---	1.0-2.5	Apparent	Dec-May	32-40	Rippable	---	-
114---------- Auburn	C/D	None--------	---	---	>6.0	---	---	12-28	Hard	---	-
115*: Auburn----------	C/D	None--------	---	---	>6.0	---	---	12-28	Hard	---	-
Argonaut---------	D	None--------	---	---	>6.0	---	---	22-34	Rippable	---	-
116*: Auburn----------	C/D	None--------	---	---	>6.0	---	---	12-28	Hard	---	-
Argonaut---------	D	None--------	---	---	>6.0	---	---	22-34	Rippable	---	-
Rock outcrop.											
117*: Auburn----------	C/D	None--------	---	---	>6.0	---	---	12-28	Hard	---	-

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	H
					Ft			In		In	
117*: Rock outcrop.											
118*: Auburn	C/D	None	---	---	>6.0	---	---	12-28	Hard	---	
Sobrante	C	None	---	---	>6.0	---	---	22-40	Rippable	---	
119*, 120*, 121*: Auburn	C/D	None	---	---	>6.0	---	---	12-28	Hard	---	
Sobrante	C	None	---	---	>6.0	---	---	22-40	Rippable	---	
Rock outcrop.											
122, 123 Boomer	B	None	---	---	>6.0	---	---	40-60	Rippable	---	
124*, 125*, 126*: Boomer	B	None	---	---	>6.0	---	---	40-60	Rippable	---	
Rock outcrop.											
127, 128 Boomer variant	C	None	---	---	>6.0	---	---	50-72	Rippable	---	
129 Caperton	D	None	---	---	>6.0	---	---	8-20	Rippable	---	
130*, 131*: Caperton	D	None	---	---	>6.0	---	---	8-20	Rippable	---	
Andregg	C	None	---	---	>6.0	---	---	24-40	Rippable	---	
132*, 133*: Caperton	D	None	---	---	>6.0	---	---	8-20	Rippable	---	
Rock outcrop.											
134, 135, 136, 137, 138, 139 Cohasset	B	None	---	---	>6.0	---	---	40-80	Rippable	---	
140 Cometa	D	None	---	---	>6.0	---	---	>60	---	---	
141*: Cometa	D	None	---	---	>6.0	---	---	>60	---	---	

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cement pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Ha n
					Ft			In		In	
141*: Fiddyment	D	None	---	---	>6.0	---	---	21-38	Rippable	20-37	Ri p
142*: Cometa	D	None	---	---	>6.0	---	---	>60	---	---	-
Ramona	B	None	---	---	>6.0	---	---	>60	---	---	-
143--- Dubakella	D	None	---	---	>6.0	---	---	21-33	Hard	---	-
144--- Exchequer	D	None	---	---	>6.0	---	---	8-20	Hard	---	-
145*: Exchequer	D	None	---	---	>6.0	---	---	8-20	Hard	---	-
Rock outcrop.											
146--- Fiddyment	D	None	---	---	>6.0	---	---	21-38	Rippable	20-37	Ri p
147*: Fiddyment	D	None	---	---	>6.0	---	---	21-38	Rippable	20-37	Ri p
Kaseberg	D	None	---	---	>6.0	---	---	11-21	Hard	10-20	Ha
148*: Henneke	D	None	---	---	>6.0	---	---	10-20	Hard	---	-
Rock outcrop.											
149, 150--- Horseshoe	B	None	---	---	>6.0	---	---	>60	---	---	-
151*: Horseshoe	B	None	---	---	>6.0	---	---	>60	---	---	-
Rubble land.											
152, 153--- Inks	D	None	---	---	>6.0	---	---	12-20	Rippable	---	-
154*: Inks	D	None	---	---	>6.0	---	---	12-20	Rippable	---	-
Exchequer	D	None	---	---	>6.0	---	---	8-20	Hard	---	-
155--- Inks variant	B	None	---	---	>6.0	---	---	30-54	Rippable	---	-

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	H
					Ft			In		In	
156*:											
Iron Mountain----	D	None--------	---	---	>6.0	---	---	5-20	Hard	---	
Rock outcrop.											
157, 158, 159, 160----------	B	None--------	---	---	>6.0	---	---	40-60	Rippable	---	
Josephine											
161*:											
Josephine--------	B	None--------	---	---	>6.0	---	---	40-60	Rippable	---	
Rock outcrop.											
162----------	C	None--------	---	---	>6.0	---	---	>60	---	---	
Kilaga											
163----------	C	None--------	---	---	>6.0	---	---	15-35	Rippable	---	
Mariposa											
164*, 165*, 166*:											
Mariposa---------	C	None--------	---	---	>6.0	---	---	15-35	Rippable	---	
Josephine--------	B	None--------	---	---	>6.0	---	---	40-60	Rippable	---	
167*, 168*:											
Mariposa---------	C	None--------	---	---	>6.0	---	---	15-35	Rippable	---	
Rock outcrop.											
169*, 170*:											
Maymen-----------	D	None--------	---	---	>6.0	---	---	8-20	Hard	---	
Rock outcrop.											
171, 172----------	B	None--------	---	---	>6.0	---	---	22-40	Rippable	---	
McCarthy											
173*.											
Pits and dumps											
174, 175----------	B	None--------	---	---	>6.0	---	---	>60	---	---	
Ramona											
176*, 177*:											
Redding----------	D	None--------	---	---	>6.0	---	---	>60	---	20-34	Ri
											p
Corning----------	D	None--------	---	---	>6.0	---	---	>60	---	---	

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cement pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Ha
					Ft			In		In	
178*. Riverwash											
179*. Rock outcrop											
180*. Rubble land											
181---------- San Joaquin	D	None--------	---	---	>6.0	---	---	>60	---	20-40	R
182*: San Joaquin------	D	None--------	---	---	>6.0	---	---	>60	---	20-35	R
Cometa----------	D	None--------	---	---	>6.0	---	---	>60	---	---	
183, 184, 185----- Sierra	B	None--------	---	---	>6.0	---	---	40-80	Rippable	---	
186, 187, 188, 189---------- Sites	C	None--------	---	---	>6.0	---	---	>40	---	---	
190*: Sites----------	C	None--------	---	---	>6.0	---	---	>40	---	---	
Rock outcrop.											
191---------- Sobrante	C	None--------	---	---	>6.0	---	---	22-40	Rippable	---	
192*---------- Xerofluvents	B	Occasional	Brief-----	Dec-May	2.5-4.0	Apparent	Dec-Apr	>60	---	---	
193*, 194*-------- Xerofluvents	B	Common------	Brief-----	Nov-Apr	2.5-4.8	Apparent	Dec-Apr	>36	Rippable	---	
195*---------- Xerofluvents	C	Occasional	Brief-----	Dec-Apr	1.5-2.5	Perched	Dec-Apr	>60	---	20-36	R
196*---------- Xerorthents	D	None--------	---	---	>6.0	---	---	>60	---	---	
197*---------- Xerorthents	D	Frequent----	Brief-----	Nov-Apr	>6.0	---	---	>60	---	---	

* See map unit description for the composition and behavior of the map unit.

TABLE 14.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Aiken	Clayey, kaolinitic, mesic Xeric Haplohumults
Alamo	Fine, montmorillonitic, thermic Typic Duraquolls
*Alamo variant	Fine, montmorillonitic, thermic Chromic Pelloxererts
Andregg	Coarse-loamy, mixed, thermic Typic Haploxerolls
Argonaut	Fine, mixed, thermic Mollic Haploxeralfs
Auburn	Loamy, mixed, thermic Ruptic-Lithic Xerochrepts
Boomer	Fine-loamy, mixed, mesic Ultic Haploxeralfs
Boomer variant	Fine, kaolinitic, mesic Ultic Palexeralfs
Caperton	Loamy, mixed, thermic, shallow Entic Haploxerolls
Cohasset	Fine-loamy, mixed, mesic Ultic Haploxeralfs
Cometa	Fine, mixed, thermic Typic Palexeralfs
Corning	Fine, mixed, thermic Typic Palexeralfs
*Dubakella	Clayey-skeletal, serpentinitic, mesic Mollic Haploxeralfs
Exchequer	Loamy, mixed, nonacid, thermic Lithic Xerorthents
Fiddyment	Fine-loamy, mixed, thermic Typic Durixeralfs
Henneke	Clayey-skeletal, serpentinitic, thermic Lithic Argixerolls
Horseshoe	Fine-loamy, mixed, mesic Xeric Haplohumults
Inks	Loamy-skeletal, mixed, thermic Lithic Argixerolls
Inks variant	Loamy-skeletal, mixed, thermic Ultic Argixerolls
Iron Mountain	Medial, mesic Lithic Mollic Vitrandepts
Josephine	Fine-loamy, mixed, mesic Typic Haploxerults
Kaseberg	Loamy, mixed, thermic, shallow Typic Durochrepts
Kilaga	Fine, mixed, thermic Mollic Haploxeralfs
Mariposa	Fine-loamy, mixed, mesic Ruptic-Lithic-Xerochreptic Haploxerults
Maymen	Loamy, mixed, mesic Dystric Lithic Xerochrepts
McCarthy	Medial-skeletal, mesic Umbric Vitrandepts
Ramona	Fine-loamy, mixed, thermic Typic Haploxeralfs
Redding	Fine, kaolinitic, thermic Abruptic Durixeralfs
San Joaquin	Fine, mixed, thermic Abruptic Durixeralfs
Shenandoah	Fine, montmorillonitic, thermic Aquic Palexeralfs
Sierra	Fine-loamy, mixed, thermic Ultic Haploxeralfs
Sites	Clayey, kaolinitic, mesic Xeric Haplohumults
Sobrante	Fine-loamy, mixed, thermic Mollic Haploxeralfs
Xerofluvents	Xerofluvents Thermic
Xerorthents	Xerorthents

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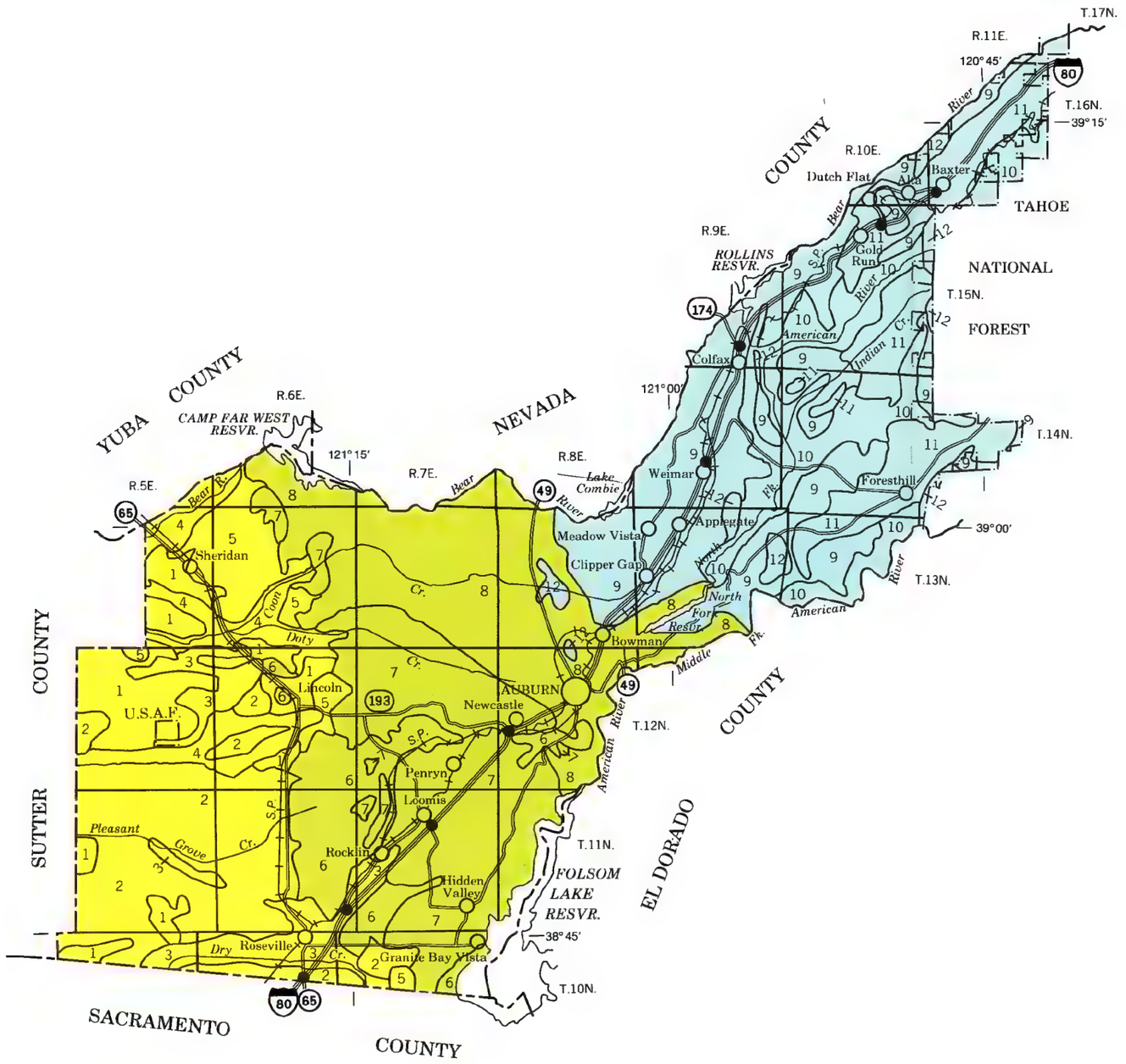


MAP UNITS

SOILS ON TERRACES AND ALLUVIAL BOTTOMS

1. San Joaquin-Cometa: Undulating, moderately deep and deep, well drained soils that have a dense clay subsoil; on terraces
2. Fiddyment-Cometa-Kaseberg: Undulating to rolling, deep to shallow, well drained soils that are underlain by siltstone; on terraces
3. Cometa-Ramona: Undulating, deep and very deep, well drained soils; on terraces
4. Xerofluvents-Kilaga-Ramona: Nearly level, very deep, well drained to somewhat poorly drained soils; on alluvial bottoms
5. Redding-Corning: Undulating to rolling, moderately deep and very deep, well drained soils that have a dense clay subsoil; on high terraces

SOILS ON FOOTHILLS

6. Exchequer-Inks: Undulating to steep, well drained and somewhat excessively drained soils that are shallow over volcanic rock
7. Andregg-Caperton-Sierra: Undulating to steep, well drained and somewhat excessively drained soils that are deep to shallow over granitic rock
8. Auburn-Sobrante: Undulating to very steep, well drained soils that are shallow or moderately deep over metamorphic rock

SOILS ON MOUNTAINOUS UPLANDS

9. Mariposa-Josephine-Sites: Undulating to steep, well drained soils that are shallow to deep over metamorphic rock
10. Maymen-Mariposa: Hilly to very steep, well drained and somewhat excessively drained soils that are shallow or moderately deep over metamorphic rock
11. Cohasset-Aiken-McCarthy: Undulating to steep, well drained soils that are moderately deep to very deep over volcanic rock
12. Dubakella-Rock outcrop: Rolling to steep, well drained soils that are moderately deep over serpentine; also Rock outcrop

Compiled 1979

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNIVERSITY OF CALIFORNIA EXPERIMENT STATION

GENERAL SOIL MAP

PLACER COUNTY, WESTERN PART CALIFORNIA

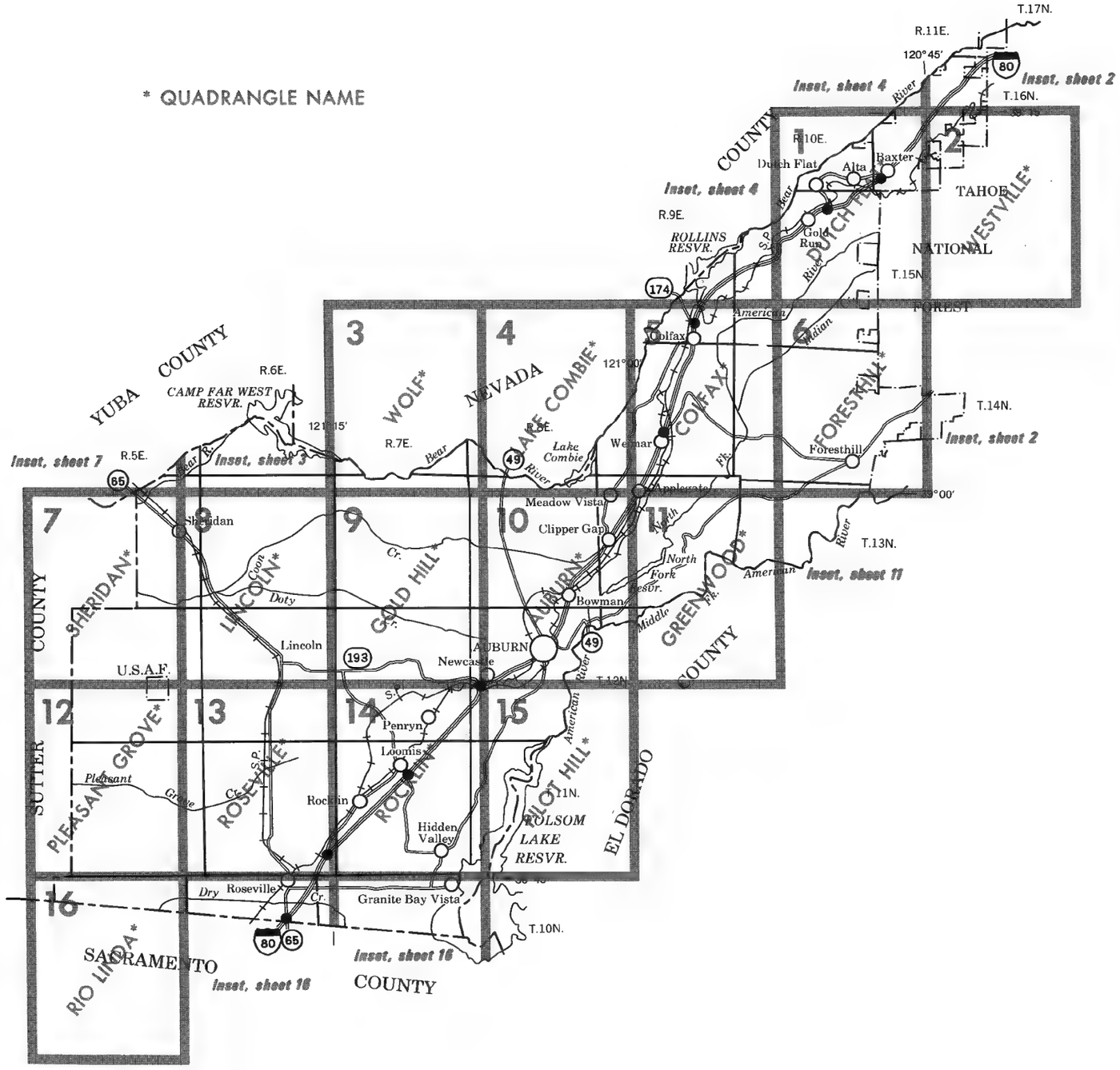
Scale 1: 380,160

1 0 1 2 3 4 5 Miles

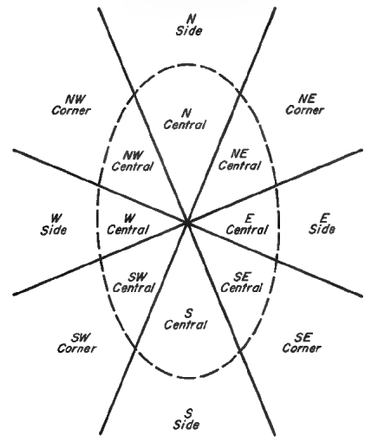
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

N

* QUADRANGLE NAME



INDEX TO LOCATIONS ON MAP SHEETS



LOCATION OF PROFILES REPRESENTATIVE OF SOIL SERIES

Series	Map-Sheet	Location
Aiken	6	S.W. Corner
Alamo	12	N.E. Corner
Alamo Variant	13	East Side
Andregg	16	Bottom Insert
Argonaut	9	N.E. Corner
Auburn	9	East Central
Boomer	10	N.W. Corner
Boomer Variant	4	South Side
Caperton	14	South Side
Cohasset	1	N.E. Central
Cometa	13	West Side
Corning	8	N.W. Corner
Dubakella	5	South Side
Exchequer	13	N.E. Central
Fiddyment	13	S.W. Corner
Henneke	10	S. W. Central
Horseshoe	2	North Side
Inks	14	N.W. Corner
Inks Variant	10	South Side
Iron Mountain	2	N.W. Corner
Josephine	4	Top Insert
Kaseberg	13	North Central
Kilaga	8	South Side
Mariposa	5	West Central
Maymen	5	S.E. Central
McCarthy	6	South Side
Ramona	8	S.W. Corner
Redding	8	West Central
San Joaquin	8	South Side
Shenandoah	3	On Insert
Sierra	15	N.W. Corner
Sites	4	Top Insert
Sobrante	9	East Side

INDEX TO MAP SHEETS

PLACER COUNTY, WESTERN PART CALIFORNIA

Scale 1: 380,160

1 0 1 2 3 4 5 Miles

SOIL LEGEND

SYMBOL	NAME
100	Aiken loam, 2 to 9 percent slopes
101	Aiken loam, 9 to 15 percent slopes
102	Aiken cobbly loam, 2 to 15 percent slopes
103	Aiken cobbly loam, 15 to 30 percent slopes
104	Alamo-Fiddyment complex, 0 to 5 percent slopes
105	Alamo Variant clay, 2 to 15 percent slopes
106	Andregg coarse sandy loam, 2 to 9 percent slopes
107	Andregg coarse sandy loam, 9 to 15 percent slopes
108	Andregg coarse sandy loam, 15 to 30 percent slopes
109	Andregg coarse sandy loam, rocky, 2 to 15 percent slopes*
110	Andregg coarse sandy loam, rocky, 15 to 30 percent slopes*
111	Andregg coarse sandy loam, rocky, 30 to 50 percent slopes*
112	Andregg-Rock outcrop complex, 5 to 30 percent slopes*
113	Andregg-Shenandoah complex, 2 to 15 percent slopes
114	Auburn silt loam, 2 to 15 percent slopes
115	Auburn-Argonaut complex, 2 to 15 percent slopes
116	Auburn-Argonaut-Rock outcrop complex, 2 to 15 percent slopes
117	Auburn-Rock outcrop complex, 2 to 30 percent slopes*
118	Auburn-Sobrante silt loams, 15 to 30 percent slopes
119	Auburn-Sobrante-Rock outcrop complex, 2 to 30 percent slopes*
120	Auburn-Sobrante-Rock outcrop complex, 30 to 50 percent slopes*
121	Auburn-Sobrante-Rock outcrop complex, 50 to 70 percent s opes*
122	Boomer loam, 2 to 15 percent slopes
123	Boomer loam, 15 to 30 percent slopes
124	Boomer-Rock outcrop complex, 5 to 30 percent slopes*
125	Boomer-Rock outcrop complex, 30 to 50 percent slopes*
126	Boomer-Rock outcrop complex, 50 to 70 percent slopes*
127	Boomer Variant stony sandy loam, 2 to 15 percent slopes
128	Boomer Variant very stony sandy loam, 15 to 50 percent slopes
129	Caperton grave ly coarse sandy loam, 2 to 30 percent slopes*
130	Caperton Andregg coarse sandy loams, 2 to 15 percent slopes
131	Caperton-Andregg coarse sandy loams, 15 to 30 percent slopes
132	Caperton-Rock outcrop complex, 2 to 30 percent slopes*
133	Caperton-Rock outcrop complex, 30 to 50 percent slopes*
134	Cohasset loam, 2 to 9 percent slopes
135	Cohasset loam, 9 to 15 percent slopes
136	Cohasset loam, 15 to 30 percent slopes
137	Cohasset cobbly loam, 5 to 15 percent slopes
138	Cohasset cobbly loam, 15 to 30 percent slopes
139	Cohasset cobbly loam, 30 to 50 percent slopes
140	Cometa sandy loam, 1 to 5 percent slopes
141	Cometa-Fiddyment complex, 1 to 5 percent slopes
142	Cometa-Ramona sandy loams, 1 to 5 percent slopes
143	Dubakella very stony loam, 9 to 50 percent slopes*
144	Exchequer very stony loam, 2 to 15 percent slopes
145	Exchequer-Rock outcrop complex, 2 to 30 percent slopes*
146	Fiddyment loam, 1 to 8 percent slopes*
147	Fiddyment-Kaseberg loams, 2 to 9 percent slopes
148	Henneke-Rock outcrop complex, 5 to 50 percent slopes*
149	Horseshoe gravelly loam, 2 to 9 percent slopes
150	Horseshoe gravelly loam, 9 to 30 percent slopes
151	Horseshoe Rubble land complex, 2 to 30 percent slopes*
152	Inks cobbly loam, 2 to 30 percent slopes*
153	Inks cobbly loam, 30 to 50 percent slopes*
154	Inks-Exchequer complex, 2 to 25 percent slopes*
155	Inks Variant cobbly loam, 2 to 30 percent slopes*
156	Iron Mountain-Rock outcrop complex, 2 to 30 percent slopes
157	Josephone loam, 2 to 9 percent slopes
158	Josephine loam, 9 to 15 percent slopes
159	Josephine loam, 15 to 30 percent slopes
160	Josephine loam, 30 to 50 percent slopes
161	Josephine -Rock outcrop complex, 15 to 50 percent slopes*
162	Kilaga loam
163	Mariposa gravelly oam, 5 to 30 percent s opes*
164	Mariposa-Josephine complex, 5 to 30 percent slopes*
165	Mariposa-Josephine complex, 30 to 50 percent slopes*
166	Mariposa-Josephine complex, 50 to 70 percent slopes*
167	Mariposa-Rock outcrop complex, 5 to 50 percent slopes*
168	Mariposa-Rock outcrop complex, 50 to 70 percent slopes*
169	Maymen-Rock outcrop complex, 9 to 50 percent slopes*
170	Maymen-Rock outcrop complex, 50 to 75 percent slopes*
171	McCarthy cobbly sandy loam, 5 to 30 percent slopes*
172	McCarthy cobbly sandy loam, 30 to 50 percent slopes*
173	Pits and dumps*
174	Ramona sandy loam, 0 to 2 percent slopes
175	Ramona sandy loam, 2 to 9 percent slopes
176	Redding and Corning gravelly loams, 2 to 9 percent slopes
177	Redding and Corning gravelly loams, 9 to 15 percent slopes
178	Riverwash*
179	Rock outcrop*
180	Rubble land*
181	San Joaquin sandy loam, 1 to 5 percent s opes
182	San Joaquin-Cometa sandy loams, 1 to 5 percent slopes
183	Sierra sandy loam, 2 to 9 percent slopes
184	Sierra sandy loam, 9 to 15 percent slopes
185	Sierra sandy loam, 15 to 30 percent slopes
186	Sites oam, 2 to 9 percent slopes
187	Sites loam, 9 to 15 percent s opes
188	Sites loam, 15 to 30 percent slopes
189	Sites loam, 30 to 50 percent slopes
190	Sites-Rock outcrop complex, 15 to 50 percent slopes*
191	Sobrante silt loam, 2 to 15 percent slopes
192	Xerofluvents, sandy*
193	Xerofluvents, occasionally flooded*
194	Xerofluvents, frequently flooded*
195	Xerofluvents, hardpan substratum*
196	Xerorthents, cut and fill areas*
197	Xerorthents, placer areas*

*Broadly defined

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES
- National
- State
- County, parish, municipo
- Reservation, national or state
- Small park, cemetery, airfield, airport, floodpool, etc — Davis Airstrip — Cem — FLOOD POOL LINE
- Land grant
- Limit of soil survey (labeled)

TOWNSHIP OR RANGE LINE, U.S. LAND SURVEY

SECTION LINE, U.S. LAND SURVEY

TOWNSHIP LINE, NOT U. S. LAND SURVEY

SECTION LINE, NOT U.S. LAND SURVEY

SECTION CORNER: Found - Indicated

BOUNDARY MONUMENT

ROADS
- Divided, hard surface
- Primary highway, hard surface
- Secondary highway, hard surface
- Light-duty road, hard or improved surface
- Unimproved road
- Trail

ROAD EMBLEMS & DESIGNATIONS
- Interstate — 70
- Federal — 410
- State — 52
- County, farm or ranch — 378

RAILROADS
- Single track
- Multiple track

LEVEES
- Without road
- With road
- With railroad

POWER TRANSMISSION LINE

LANDMARK LINE (labeled as to type) — TELEPHONE

OVERPASS - UNDERPASS

DAMS
- Large dam
- Small dam: masonry - earth — Water
- Dam with lock

MISCELLANEOUS MAP FEATURES
- Buildings (dwelling, farmstead, etc.)
- School - Church
- Buildings (barn, warehouse, etc.)
- Tanks: oil, water (labeled only if water) — Water Tank
- Wells other than water (labeled as to type) — o Oil — o Gas
- U.S mineral or location monument - Prospect — x
- Quarry - Gravel Pit
- Mine shaft - Tunnel or cave entrance
- Campsite - Picnic area
- Located or landmark object - Windmill
- Rock or coral reef
- Foreshore flat
- Rock: bare or awash — *
- Sounding - Depth curve — 10
- Horizontal control station
- Vertical control station — BM × 671 × 672
- Road fork - Section corner with e-evation — 429 — 58
- Checked spot elevation — × 5970

MISCELLANEOUS WATER FEATURES
- Land subject to controlled inundation
- Marsh or swamp
- Aqueduct tunnel
- Spring
- Falls - Rapids
- Well, artesian
- Well, irrigation
- Wet spot

WATER FEATURES

DRAINAGE
- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

CANALS OR DITCHES
- Double line — CANAL
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS
- Perennial — water
- Intermittent — intermittent

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 102 — 108

ESCARPMENTS
- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE — S

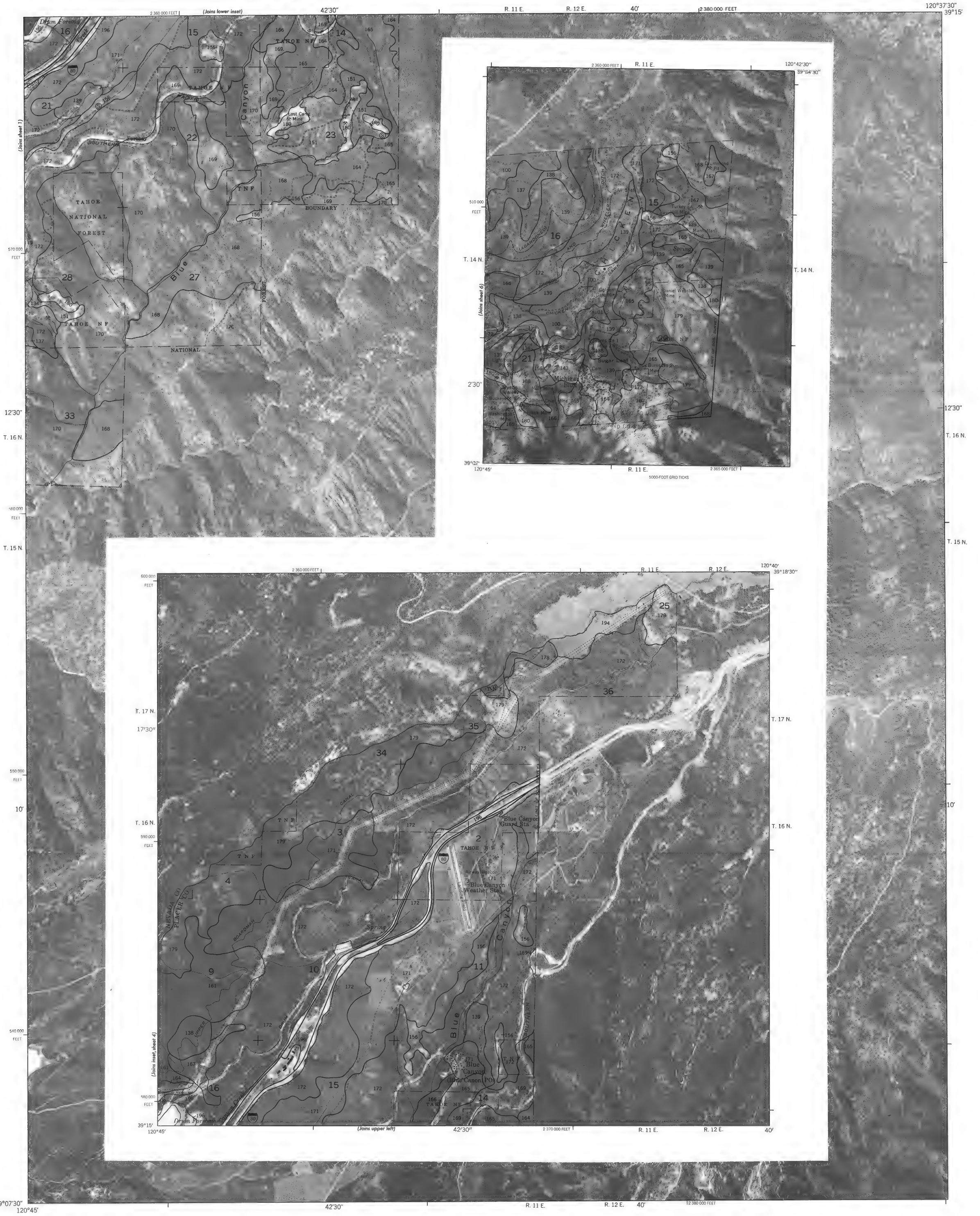
MISCELLANEOUS
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Saline spot
- Severely eroded spot
- Slide or slip (tips point up slope)
- Stony spot - Very stony spot
- Rock outcrop, sandstone
- Rock outcrop, shale

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 1
PLACER COUNTY, CALIFORNIA, WESTERN PART
(DUTCH FLAT QUADRANGLE)

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.



1 ⅝ ⅛ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

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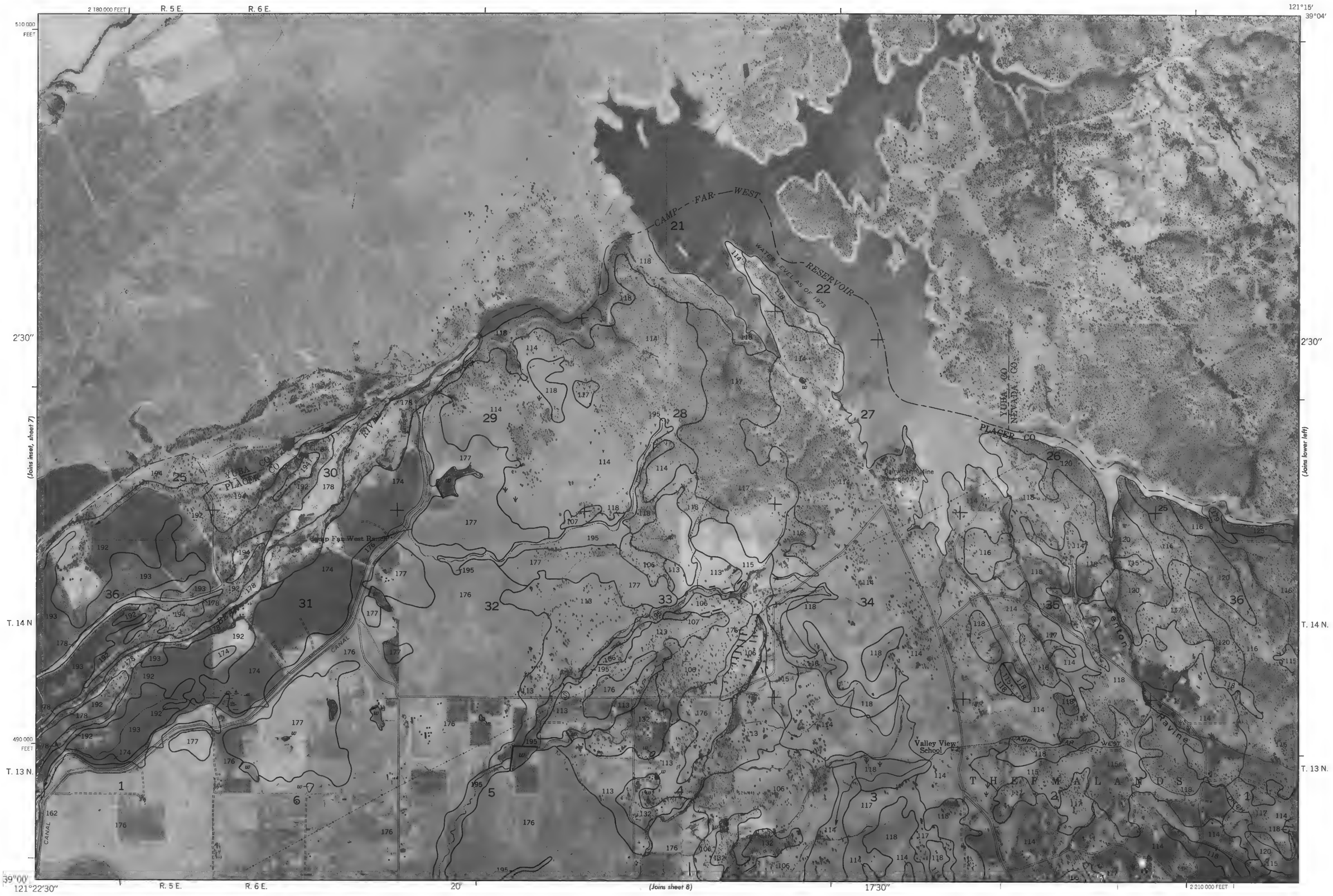
SOIL CONSERVATION SERVICE

SHEET NO. 3
PLACER COUNTY, CALIFORNIA, WESTERN PART
(WOLF QUADRANGLE AND PART OF CAMP FAR WEST QUADRANGLE)



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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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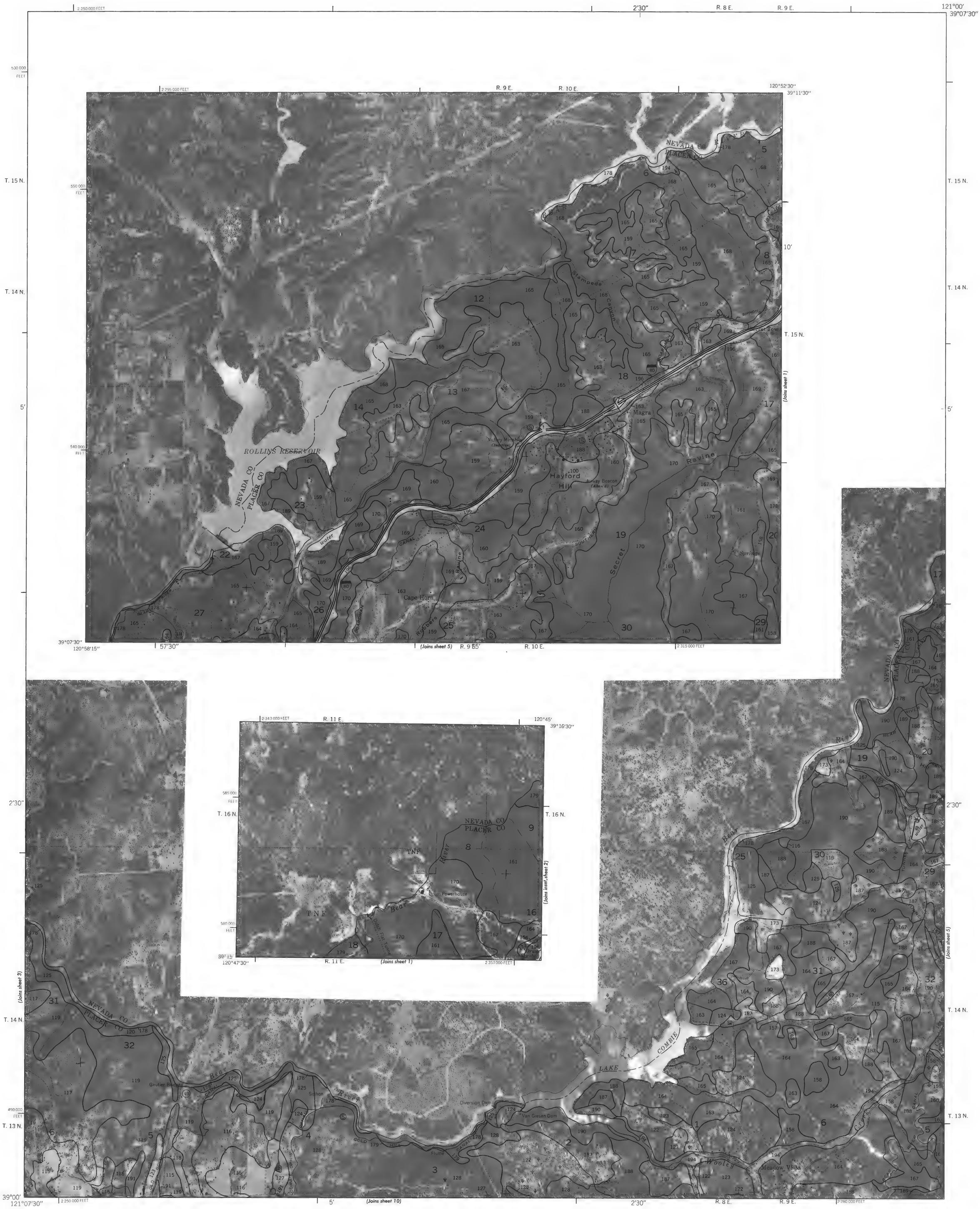
SHEET NO. 4
PLACER COUNTY, CALIFORNIA, WESTERN PART
(LAKE COMBIE QUADRANGLE AND PARTS OF CHICAGO PARK AND WASHINGTON QUADRANGLES)



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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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PLACER COUNTY, CALIFORNIA, WESTERN PART NO. 4

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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SHEET NO. 6
PLACER COUNTY, CALIFORNIA, WESTERN PART
(FORESTHILL QUADRANGLE)

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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SHEET NO. 7
PLACER COUNTY, CALIFORNIA, WESTERN PART
(SHERIDAN QUADRANGLE AND PART OF WHEATLAND QUADRANGLE)

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

PLACER COUNTY, CALIFORNIA, WESTERN PART NO. 7

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PLACER COUNTY, CALIFORNIA, WESTERN PART NO. 8

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet

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SOIL CONSERVATION SERVICE

SHEET NO. 10
PLACER COUNTY, CALIFORNIA, WESTERN PART
(AUBURN QUADRANGLE)

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

PLACER COUNTY, CALIFORNIA, WESTERN PART NO. 10

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SOIL CONSERVATION SERVICE

SHEET NO. 11
PLACER COUNTY, CALIFORNIA, WESTERN PART
(GREENWOOD QUADRANGLE AND PART OF GEORGETOWN QUADRANGLE)

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

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SHEET NO. 12
PLACER COUNTY, CALIFORNIA, WESTERN PART
(PLEASANT GROVE QUADRANGLE)

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 13

PLACER COUNTY, CALIFORNIA, WESTERN PART
(ROSEVILLE QUADRANGLE)

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 14
PLACER COUNTY, CALIFORNIA, WESTERN PART
(ROCKLIN QUADRANGLE)

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

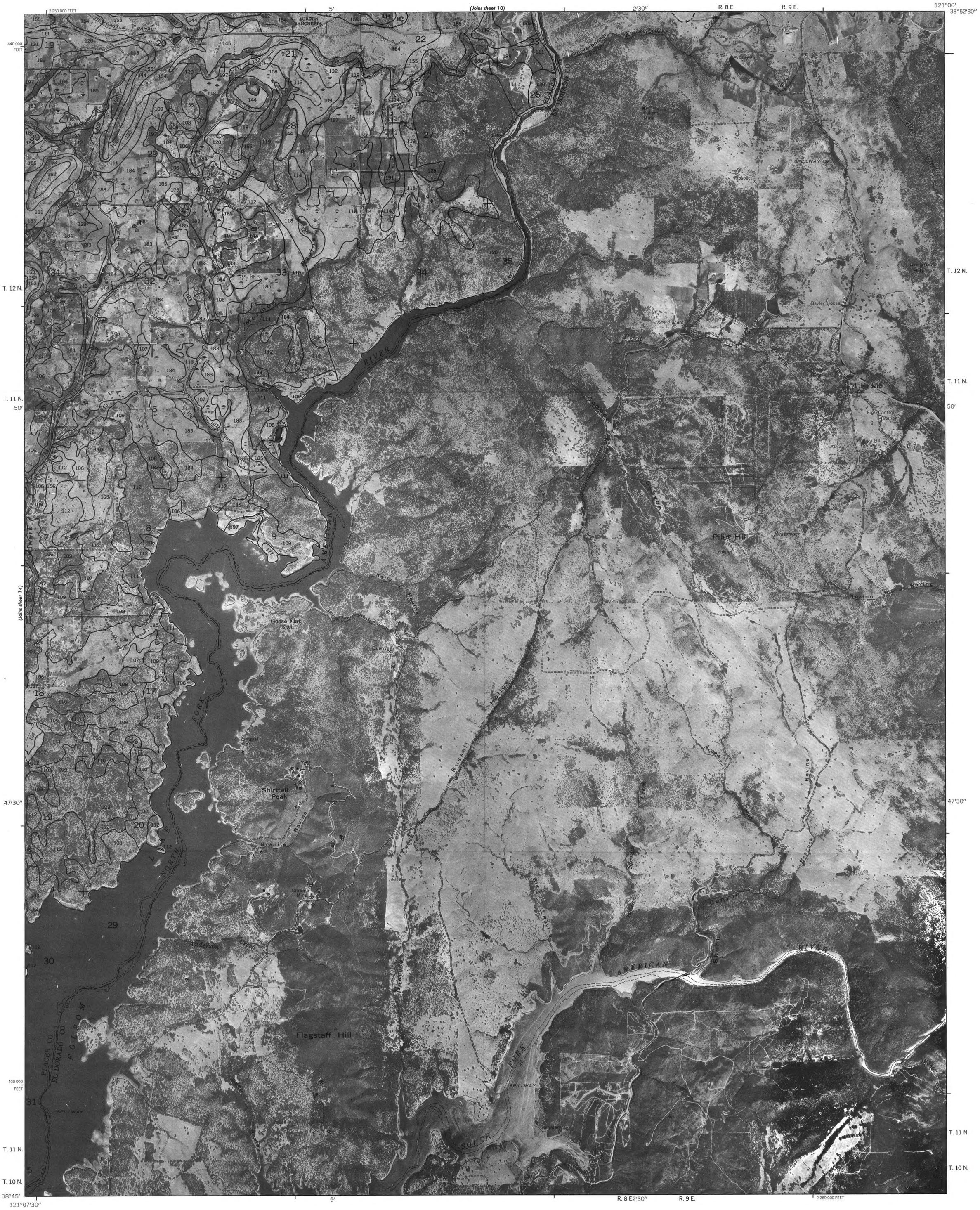
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

PLACER COUNTY, CALIFORNIA, WESTERN PART NO. 14

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 15
PLACER COUNTY, CALIFORNIA, WESTERN PART
(PILOT HILL QUADRANGLE)



1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

PLACER COUNTY, CALIFORNIA, WESTERN PART NO. 15

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 16
PLACER COUNTY, CALIFORNIA, WESTERN PART
(RIO LINDA QUADRANGLE AND PARTS OF CITRUS HEIGHTS AND FOLSOM QUADRANGLES)

This soil survey was compiled in 1977 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.